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VOLUME 12, NUMBER 24
DECEMBER 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 24
DECEMBER 15, 1979

W79-10081 --W79-10330

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

COMMENT ON 'GOVERNING EQUATIONS FOR GEOTHERMAL RESERVOIRS' BY D. H. BROWNELL, S. K. GARG, AND J. W. PRITCHETT,
Geological Survey, Sacramento, CA. Water Resources Div.
D. C. Helm.
Water Resources Research, Vol. 15, No. 3, p 723-726, June 1979. 6 ref.

Descriptors: *Hydrogeology, *Geothermal studies, *Reservoirs, *Mathematical studies, *Equations, Thermal water, Physical properties, Porosity, Continuity equation, Energy, Mass, Momentum equation, Evaluation, *Governing equations.

In their 1977 paper published in Water Resources Research, D. H. Brownell, S. K. Garg, and J. S. Pritchett developed a series of balance equations for mass, momentum, and energy. (See W78-02542). The mass balance equations (for both solid and liquid phases), as developed in their paper, require an element of interest to be fixed in space. The momentum and energy balance equations for the solid phase, as developed in their paper, require an element of interest to be fixed in the solid phase. The momentum and energy equations for the liquid phase, as developed in their paper, require an element of interest to be fixed in the liquid phase. The authors are asked to comment on the apparent ambiguity of their assuming that the entire series of balance equations can be applied to a single element of interest, rather than to the three distinct elements that are inherent in their development. The conceptual problem is illustrated by reference to the porosity term in their equations. (Woodard-USGS)
W79-10160

GEOTHERMAL RESERVOIR SIMULATION: 3. APPLICATION OF LIQUID- AND VAPOR-DOMINATED HYDROTHERMAL MODELING TECHNIQUES TO WAIRAKEI, NEW ZEALAND,
Geological Survey, Reston, VA. Water Resources Div.
J. W. Mercer, and C. R. Faust.
Water Resources Research, Vol. 15, No. 3, p 653-671, June 1979. 26 fig, 1 tab, 20 ref.

Descriptors: *Geothermal studies, *Model studies, *Simulation analysis, *Thermal properties, *Hydrothermal studies, Aquifer characteristics, Groundwater movement, Steady flow, Unsteady flow, Leakage, Heat flow, Confined water, Correlation analysis, Evaluation, *New Zealand.

A quasi three-dimensional areal model, based on finite-difference approximations, was applied to the hydrothermal field at Wairakei, New Zealand. The model simulates heat transport associated with the flow of steam and water through porous media. An analysis was made of the production aquifer under steady-state and transient flow conditions, allowing vertical flow of heat and fluid through confining beds. Computed steady-state results correlate well with observed data and indicate that portions of the aquifer had a steam cap prior to exploitation. Computed transient results also match observed data and support the hypothesis that the production aquifer is recharged through underlying confining beds. The limiting factor on production is the amount of mass available, both from storage and leakage. Although simulation results indicate that the field can maintain production rates to the year 2000, such long range predictions are unreliable due to the lack of information on the leakage properties of the confining beds. (See also W79-06303 and W79-06304) (Woodard-USGS)
W79-10162

FLUID SAMPLE COLLECTION AND DISTRIBUTION SYSTEM,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
R. L. Brooks.
U.S. Patent No. 4,151,086, 9 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1390-1391, April 24, 1979.

Descriptors: *Patents, *Water treatment, *Sampling, Water quality control, Filtering, Analytical techniques, Water analysis, Automatic control, Equipment, Backwash, Sensors.

A method and apparatus is provided for automatically collecting aqueous samples from any one of a number of sampling points along a process flow path. The samples are continuously presented to various chemical and biological analyzing sensors in various stages of filtration. The system may be sequenced around the performance of sensor analyzers to permit backwash and cleaning of sample flow filters without interupting the analyzing sequence. (Sinha-OEIS)
W79-10167

1B. Aqueous Solutions and Suspensions

THE EFFECT OF NITRIFICATION ON THE OXYGEN BALANCE OF THE UPPER CHATTAHOOCHEE RIVER, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
T. A. Ehlke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-298 347, Price codes: A02 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 79-10, 1978. 13 p, 4 fig, 4 tab, 14 ref.

Descriptors: *Nitrification, *Biochemical oxygen demand, *Bacteria, *Rivers, Reaeration, Dissolved oxygen, Water analysis, Ammonium compounds, Nitrites, Nitrates, Nitrogen, Bottom sediments, Georgia, *Upper Chattahoochee River basin, *Nitrosomonas, *Nitrobacter.

Oxygen consumption as a result of nitrification, and carbonaceous bacterial oxidation were compared in a 108 kilometer reach of the Chattahoochee River, Georgia. Nitrogenous and carbonaceous oxygen consumption were separated by using an inhibitor of nitrification 1-allyl-2-thiourea. The comparison was conducted in the laboratory using samples collected from the water column. Nitrification accounted for 38 to 52 percent of the total oxygen consumption. Nitrifying bacteria were enumerated from the same reach of the river. The population of Nitrosomonas ranged from 10 to 1,000 per milliliter in the water column and 100 to 100,000 per gram of benthic sediment. The nitrobacter population ranged from 10 to 100 per milliliter in the water column and 100 to 1,000 per gram in the benthic sediment. The concentration of ammonium, nitrite, and nitrate as N was determined from water samples collected throughout the study reach. The average rate of ammonium disappearance and of nitrate appearance was 0.02 milligram per liter per hour of flow time. (Woodard-USGS)
W79-10170

CARBON DIOXIDE IN THE OCEAN SURFACE: THE HOMOGENEOUS BUFFER FACTOR,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England). Climatic Research Unit.
E. T. Sundquist, L. N. Plummer, and T. M. L. Wigley.
Science, Vol. 204, p 1203-1205, June 1979. 1 fig, 1 tab, 15 ref.

Descriptors: *Carbon dioxide, *Oceans, *Chemical reactions, Atmosphere, Evaluation, *Ocean surface, Buffer, Marine chemistry, Homogeneous reactions, Chemical oceanography.

The amount of CO2 which can be dissolved in surface sea water depends at least partially upon the homogeneous buffer factor, which is a mathematical function of the chemical equilibrium conditions among the various dissolved inorganic species. Because these equilibria are well known, the homogeneous buffer factor is well known. Natural spatial variations depend very systematically upon sea surface temperatures, and do not contribute significantly to uncertainties in the present or future CO2 budget. (Woodard-USGS)
W79-10176

2. WATER CYCLE

2A. General

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME I, FEBRUARY 28-MARCH 3, 1977.
Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, 1977. 470 p. Correll, D. L., Editor. NSF ENV 74-24271 A03, ENV 76-22045.

Descriptors: *Watersheds(Basins), *Hydrology, *Model studies, *North America, *Conferences, Demonstration watersheds, Agricultural watersheds, Research and development, Land use, Precipitation(Atmospheric), Nutrients, Groundwater, Water balance, Water quality, Drainage, Ecosystems, Sediment discharge, Publications, Nutrient discharge, Particulate discharge.

The workshop provided for the exchange of research results, discussion of its significance in better management of drainage basins and in conducting further research on their hydrological characteristics. To better manage drainage basins requires more understanding of the quantitative and qualitative properties of drainage basins, complete characterization of their ecosystems, and application of those understandings towards solutions to problems of environmental quality. Volume I of the proceedings included papers presented in the following areas: (1) overviews of watershed programs; (2) chemical loading of the watershed; (3) hydrology; (4) nutrient discharge; and (5) particulate discharge. Each paper was followed by discussion. A list of attendees was included. (See also W79-02571, W79-02573, W79-02574 and W79-10085 thru W79-10107) (Humphreys-ISWS)
W79-10084

LAKE JACKSON WATERSHED STUDY: DESCRIPTION OF SITES, METHODOLOGY AND SCOPE OF RESEARCH,
Oak Ridge National Lab., TN.
R. R. Turner, T. M. Burton, and R. C. Harriss.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 19-33, 1977. 3 fig, 1 tab, 16 ref.

Descriptors: *Watersheds(Basins), *Water quality, *Runoff, *Urbanization, *Florida, Urban runoff, Forest watersheds, Forests, Agriculture, Cities, Storm runoff, Lakes, Rainfall, Pollutants, Suspended solids, Dissolved solids, Chloride, Silicon, Nutrients, Chemicals, Sampling, Land use, *Lake Jackson(FL).

The Lake Jackson watershed study was undertaken to quantify changes in water quality and geochemical exports resulting from urbanization within the 11,900 hectare watershed of a recreational lake in north Florida. Three subbasins of 430, 611, and 792 hectares in size and otherwise similar in all respects except land-use were instrumented for intensive hydrologic and chemical monitoring during a two-year period (June 1973-May 1976). Two of these subbasins offered considerable contrast in major land use: (1) rapidly developing urban, versus (2) stable forested-agricultural. The third was intermediate between these extremes of land use. The streams draining the subbasins were gradually intermittent with respect to flow, and thus major emphasis was placed on characterizing storm events. Hydrologic records for each water sampling station were provided through a cooperative arrangement with the Geological Survey. Water samples were collected both man-

ually and by automatic discrete samplers. Constituents measured included suspended solids, dissolved solids, chloride, dissolved silicon, and dissolved nutrients (nitrogen and phosphorus). The data obtained in this study are being used to identify and explore the hydrochemical consequences of urbanization on a small drainage basin scale. (See also W79-10084) (Sims-ISWS)
W79-10087

THE MAHANTANGO CREEK WATERSHED--AN INTERDISCIPLINARY WATERSHED RESEARCH PROGRAM IN PENNSYLVANIA,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
H. B. Pionke, and R. N. Weaver.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 83-103, 1977. 6 fig, 33 ref.

Descriptors: *Watersheds(Basins), *Research and development, *Northeast US, Rainfall, Precipitation(Atmospheric), Runoff, Hydrology, Water quality, Land use, Planning, Mining, Erosion, Geology, Soils, Infiltration, Evapotranspiration, On-site investigations, *Mahantango Creek Watershed(PA).

The objectives of this paper were to describe the scope of the watershed research program and the physical characteristics of the watershed and to present sufficient information upon which subsequent papers of this series can build to achieve their objectives. The paper was organized into 4 parts. The first 3 treat separately the watershed research programs of the Agricultural Research Service (ARS), the Northeast Watershed Research Center (NWRC), and the Mahantango Creek Watershed. Because the Mahantango Creek Watershed is a component of these 2 larger watershed research programs, the research role of the watershed must be considered in the context of the encompassing programs. The watershed was physically described in this third part. The fourth part identified, referenced, and briefly describe past research accomplishments. (See also W79-10084) (Sims-ISWS)
W79-10090

AN OVERVIEW OF THE RHODE RIVER WATERSHED PROGRAM,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
D. L. Correll.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 105-123, 1977. 1 fig, 1 tab, 15 ref. EPA R804536-01.

Descriptors: *Watersheds(Basins), *Instrumentation, *Land use, *Maryland, Water quality, Pollutants, Pollutant identification, Rain gages, Stream gages, Weirs, Sampling, Forests, Agriculture, Nutrients, Cations, Herbicides, Bacteria, Rivers, Estuaries, *Rhode River Watershed(MD).

This research program is a long-term effort to better understand specifically the functioning of a 3,332 ha eastern coastal plain drainage basin on Maryland's western shore of Chesapeake Bay. More generally, it is an effort to relate discharge characteristics to land use and to assess the transfer value of the results within the coastal plain. The major land use categories on the area are forest and old fields, pasture, row crops, residential, upland wet areas, and tidal marshes. Research was initiated in 1971 on 5 basins. Permanent weirs with automatic volume-integrating composite samplers were constructed, beginning in 1973. At the end of 1976, 11 permanent and 2 portable stations were in operation, 3 permanent stations were under construction, and 3 more permanent stations were planned and funded. Precipitation chemistry and a network of rain gauges were initiated in 1973. Runoff waters were analyzed for suspended particulate, nutrient, cation, herbicide, and bacterial parameters. In the case of small, 'single-use' watersheds, the plant cover and soil characteristics were also intensively studied. The land use of the whole area was studied by analysis of aerial photos and by door-to-door interviewing of land owners. Data gathered in the program was stored on magnetic tape. A conclusion from the analysis of the data was that land use is the most important factor in causing water quality differences in runoff from Rhode River sub-watersheds at any one time. (See also W79-10084) (Sims-ISWS)
W79-10091

HYDROLOGIC CHARACTERISTICS OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
G. S. Henderson, D. D. Huff, and T. Grizzard.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 195-210, 1977. 5 fig, 3 tab, 14 ref.

Descriptors: *Watersheds(Basins), *Demonstration watersheds, *Hydrology, *Tennessee, Research facilities, Instrumentation, Stream gages, Weirs, Rain gages, Rainfall, Precipitation(Atmospheric), Runoff, Streamflow, Evaporation, Evapotranspiration, Water balance, Discharge(Water), Groundwater, Recharge, Natural recharge, Forests, Forest watersheds, *Walker Branch Watershed(TN).

Walker Branch Watershed, a 97.5 ha deciduous forest catchment on dolomitic terrain, received annual precipitation averaging 151.1 cm over a six-year period from 1970-1976. Approximately 57% of this precipitation left the watershed as streamflow. Soil evaporation and canopy interception with subsequent evaporation loss were well represented by relationships derived for eastern hardwoods and amounted to about 12% of precipitation. Transpiration accounted for the remainder (31%) of the water loss from the watershed. Seasonal precipitation-streamflow balances showed that precipitation is relatively uniformly distributed throughout the year, while streamflow varies seasonally with high flows from December through May and low flows from June through November. Baseflow discharge patterns from the two subcatchments are different, the smaller basin yielding relatively more than the larger one. This difference is thought to be due to groundwater exchange between the two through channels in the dolomitic bedrock. The hydrologic data base is used extensively in nutrient and trace element cycling studies and in development of mechanistic hydrologic models. (See also W79-10084) (Sims-ISWS)
W79-10095

DESCRIPTIVE HYDROLOGY OF THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Oak Ridge National Lab., TN.
R. R. Turner, T. M. Burton, and R. C. Harriss.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 211-226, 1977. 2 fig, 2 tab, 20 ref.

Descriptors: *Watersheds(Basins), *Urbanization, *Land use, *Florida, Urban runoff, Forest watersheds, Agricultural watersheds, Streamflow, Storm runoff, Hydrographs, Drainage, Rainfall, Precipitation(Atmospheric), Evaporation, Hydrology, Urban hydrology.

Results of hydrologic studies on 3 adjacent watersheds in north Florida representing, respectively, urban (792 ha), suburban (430 ha), and forested-agricultural (611 ha) land uses support theory and the findings of others that urbanization (1) increases storm peak flows, (2) increases the ratio of quickflow volume to delayed flow volume, and (3) increases annual runoff. Total runoff losses from the forested-agricultural, suburban, and urban basins during the period July 1973 to June 1975 were, respectively, 31.2, 38.1, and 48.3 cm of which 39%, 51%, and 82% were quickflow. Ratios of total quickflow volume to total precipitation over the study period were 0.05, 0.08, and 0.16 for the forested-agricultural, suburban, and urban watersheds, respectively. Comparison of individual storm hydrographs also revealed striking contrasts in the relative magnitude and temporal distribution of streamflow from these watersheds. Maximum discharges during the study period were 0.19 cu m/sec/sq km (forested-agricultural), 0.75 cu m/sec/sq km (suburban), and 2.37 cu m/sec/sq km (urban). When combined with results of contemporaneous water quality studies on the same watersheds, these hydrologic findings offer an ideal example of some hydrochemical consequences of urbanization on a small watershed scale. (See also W79-10084) (Sims-ISWS)
W79-10096

THE MAHANTANGO CREEK WATERSHED--GENERAL HYDROLOGY AND RESEARCH RESULTS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
W. J. Gburek.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 227-250, 1977. 8 fig, 6 tab, 32 ref.

Descriptors: *Watersheds(Basins), *Networks, *Research facilities, *Hydrology, Precipitation(Atmospheric), Rainfall, Runoff, Streamflow, Water quality, Soil moisture, Groundwater, Spatial distribution, Temporal distribution, Instrumentation, Rain gages, Stream gages, Storms, Hydrological data, *Mahantango Creek Watershed(PA).

The experimental watersheds of the Agricultural Research Service (ARS), USDA, have traditionally been a major source of continuous, long-term, small watershed hydrologic data for the scientific community. Data from these watersheds, representing varied physiographic provinces of the U.S., have been used extensively by university researchers, private consultants and planners, and other governmental research and planning agencies. The Mahantango Creek Watershed in east-central Pennsylvania was chosen as the Northeast Watershed Research Center (NWRC) research watershed. One reason for this choice was that continuous flow records had been collected since 1930 at a U.S. Geological Survey streamgage at the watershed outlet. The NWRC installed an instrumentation network over its entirety to collect routine rainfall-runoff data. The purposes of this network were: to characterize general magnitudes and variabilities associated with the watershed's rainfall-runoff processes; to develop a limited data base upon which to test future concepts developed; and to indicate any unexpected abnormalities within the watershed's hydrologic cycle. The instrumentation of the network was described, and some research results were reported. (See also W79-10084) (Sims-ISWS)
W79-10097

THE MAHANTANGO CREEK WATERSHED--EVALUATING THE SHALLOW GROUNDWATER REGIME,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2F.
W79-10098

OBSERVATIONS ON THE WATER BALANCE FOR SEVEN SUB-BASINS OF RHODE RIVER, MARYLAND,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
G. R. Chirlin, and R. W. Schaffner.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 277-306, 1977. 8 fig, 9 tab, 36 ref. EPA

R804536-01.

Descriptors: *Water balance, *Rainfall, *Runoff, *Evaporation, *Maryland, Watersheds(Basins), Rain gages, Stream gages, Streamflow, Precipitation(Atmospheric), Sampling, Streams, Rivers, Evapotranspiration, Storage, Rainfall-runoff relationships, Meteorology, Hydrology, *Rhode River Watershed(MD).

The precipitation and streamflow gauging and sampling facilities on the Rhode River, Maryland, watershed were described. Seven sub-basins were examined over the three calendar year period 1974-75-76 for basin characteristics and precipitation, runoff, and their difference ('net input'). Average annual rainfall for the period was 119 cm at a central gauge. Sub-basins range in size from 28.2 ha to 253.7 ha and in annual discharge from 67,700 to 913,000 cu m/yr. The weir of sub-basin 108 suffers significant submergence at high flows, as confirmed by its uniquely high flows per unit area at those times. Deep losses from the watersheds seem unlikely in view of the very low conductivity of an underlying clay formation (the Marlboro Clay) and the close inter-basin agreement in yearly runoff depths. However, the true thickness and extent of the clay have not been surveyed. Interception, gross storage, and transpiration were crudely estimated for sub-basin 101, the respective percentages being 11%, 22%, and 42% of annual precipitation. (See also W79-10084) (Sims-ISWS)
W79-10099

NUTRIENT EXPORT FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W79-10101

PATTERNS OF ORGANIC MATTER TRANSPORT ON WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
C. E. Comiskey, G. S. Henderson, R. H. Gardner, and F. W. Woods.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 439-469, 1977. 8 fig, 5 tab, 35 ref.

Descriptors: *Organic matter, *Streams, *Watersheds(Basins), Vegetation, Leaves, Rainfall, Runoff, Precipitation(Atmospheric), Streamflow, Detritus, Nutrients, Streambeds, Biology, Hydrology, Hydraulics, *Walker Branch Watershed(TN).

Aspects of a study of organic material transport in a headwater stream system were discussed. Transfer of large (greater than 1 mm) particulate allochthonous organic leaf material to the heterotrophically based aquatic system occurred primarily as direct leaf fall and blow-in. Factors determining allochthonous inputs and residence time in the stream system involved the interaction of phenological, geomorphic, and meteorological phenomena. Leaf fall inputs followed the normal temperate deciduous cycle with maximum inputs occurring in the autumn during litterfall. Quantification of blow-in included three variables: aspect, percent slope, and month. Results showed an initial peak during litterfall and a large peak during the mid-winter to mid-spring period. The steepest, southwest-facing slopes generally contributed the highest inputs. Standing crops of large (greater than 1 mm) particulate organic leaf material on 4 stream habitat types (dry gravel, stream flow gravel, dry bedrock, and bedrock pools) showed significant differences (alpha = 0.05) for both date and habitat type, reflecting the influences of the hydrologic cycle and within-system biological processing on the allochthonous inputs. The temporal sequence of allochthonous organic inputs to the stream system serves as a source of replenishment of the aquatic food base which might otherwise be severely depleted during periods of high stream discharge. (See also W79-10084) (Sims-ISWS)
W79-10106

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME II, FEBRUARY 28-MARCH 3, 1977,
Report No. NSF/RA-770255. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, 1977. 455 p. Correll, D.L., Editor. NSF ENV 74-24271 A03, ENV 76-22045.

Descriptors: *Watersheds(Basins), *Model studies, *North America, *Conferences, *Water pollution, Agricultural watersheds, Land use, Ecosystems, Demonstration watersheds, Organic matter, Toxins, Suspended load, Suspended solids, Nutrients, Water pollution sources, Water quality, Coliforms, Microorganisms, Oligotrophy, Sediment transport, Research and development, Trace elements, Herbicides, Water sampling, Microorganism discharge, Toxic materials discharge, Particulate discharge.

The workshop provided for the exchange of research results and for discussion of its significance in better management of drainage basins and in conducting further research on hydrological characteristics of drainage basins. Better management of drainage basins requires more understanding of the quantitative and qualitative properties of drainage basins, complete characterization of their ecosystems, and application of those understandings towards solutions to problems of environmental quality. Volume II of the proceedings included papers presented in the following areas: (1) particulate discharge; (2) microorganism discharge; (3) toxic materials discharge; and (4) watershed modeling. Each paper was followed by discussion. (See also W79-02572, W79-10084, and W79-10108 thru W79-10126) (Humphreys-ISWS)
W79-10107

SUSPENDED AND DISSOLVED SOLIDS EXPORTS FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 2J.
W79-10108

LARGE PARTICULATE ORGANIC MATTER PROCESSING IN STREAM ECOSYSTEMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. R. Webster.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 505-526, 1977. 5 fig, 6 tab, 38 ref. NSF GB-43255, NSF AG-199, BMS 76-00761.

Descriptors: *Demonstration watersheds, *Forest watersheds, *North Carolina, *Water pollution sources, Organic matter, Streams, Watersheds(Basins), Ecosystems, Litter, Leaves, Vegetation, Trees, Deciduous forests, On-site investigations, Mountain forests, Leaf litterfall.

The stream ecosystems of eastern deciduous forests are highly adapted to their riparian terrestrial surroundings. Particulate organic matter inputs from the riparian vegetation are processed by the combined action of microbes and invertebrates and the mechanical action of flowing water. In unperturbed Coweeta streams, processing efficiency is 95-99%. Processing efficiency is less in watersheds where the vegetation has been disturbed. Comparison of Coweeta data with other studies suggested a greater processing efficiency in southeastern than northeastern streams. (See also W79-10107) (Humphreys-ISWS)
W79-10109

DISCHARGE OF SUSPENDED PARTICULATES FROM RHODE RIVER SUBWATERSHEDS,
Smithsonian Institution, Washington, DC. Div. of Sedimentology.
For primary bibliographic entry see Field 2J.
W79-10110

THE APPLICATION OF ANALYTIC AND MECHANISTIC HYDROLOGIC MODELS TO THE STUDY OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
D. D. Huff, G. S. Henderson, C. L. Begovich, R. J. Luxmoore, and J. R. Jones.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 741-766, 1977. 12 fig, 2 tab, 27 ref.

Descriptors: *Watersheds(Basins), *On-site investigations, *Model studies, Streamflow, Runoff, Base flow, Storm runoff, Groundwater, Groundwater movement, Evaporation, Evapotranspiration, Rainfall, Precipitation(Atmospheric), Storage, Soil water, Hydrology, *Walker Branch Watershed(TN).

Hydrologic studies at Walker Branch Watershed combine field data collection, use of analytic methods for data processing, and the use of models to explore hypotheses that result from analysis. For example, examination of delayed flow from the two sub-basins of Walker Branch showed a quantitative exchange from one sub-basin to the other. The data also suggested a relationship between delayed flow rate and fraction of delayed flow volume exchanged. Simulation results supported the analysis but raised additional questions for further field study and data analysis. A similar approach to studies of quick-flow and evapotranspiration leads to a suggestion that storm runoff in uniform for both sub-basins and is related to the moisture content of surface soils, as influenced by evapotranspiration. (See also W79-10107) (Sims-ISWS)
W79-10120

SAMPLING METHODOLOGIES FOR ASSESSING RURAL RUNOFF,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik, F. Koehler, L. Bliven, J. W. Gilliam, and M. R. Overcash.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 791-808, 1977. 1 fig, 8 tab, 8 ref. EPA R803328.

Descriptors: *Runoff, *Sampling, *Rural areas, *Water quality, Streamflow, Sediment transport, Chemicals, Pollutants, Nitrogen, Phosphates, Nitrates, Chlorides, Carbon, Chemical oxygen demand, Sediments, Rainfall, Base flow, Analytical techniques, Methodology, Hydrology.

Sample methodologies for obtaining information to describe small rural streams were evaluated. Two types of sampling, grab and automated, were utilized in the present study. Estimates from both types of sampling were presented, and the implications of the differences in data retrieved were discussed. Instrumentation and associated hardware for automated sampling sites were detailed, and the rationale utilized in the design of the automated sampling program was explained. The suite of parameters measured was described, and the relative importance of each parameter as an indicator of water quality was discussed. The concept of an essential set of parameters was introduced, and some tentative conclusions were proffered. The use of climatological data to estimate the total number of field trips necessary to satisfy data base requirements within a project time span was described. Many researchers have investigated methods for estimating annual sediments yields from relatively few data points using the flow-duration sediment-transport method. The feasibility of this concept to calculate the average annual

transport of total nitrogen and total phosphate was investigated. The usefulness and limitations of this method were discussed. (See also W79-10107) (Sims-ISWS)
W79-10121

PROBABILITY SAMPLING OF SMALL STREAMS: PROBLEMS AND RESULTS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
For primary bibliographic entry see Field 7B.
W79-10122

A LINEAR APPROACH TO THE CALCULATION OF AREA YIELD COEFFICIENTS BASED ON LAND USE,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10123

APPLICATIONS OF A MARYLAND VERSION OF USDAHL-74 TO A WATERSHED IN PRINCE GEORGE'S COUNTY, MARYLAND,
Maryland Univ., College Park.
H. N. Holtan, J. P. Ormsby, and G. T. Fisher.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 887-908, 1977. 4 fig, 4 tab, 6 ref, 1 append.

Descriptors: *Watersheds(Basins), *Maryland, *Runoff, *Water quality, *Model studies, Mathematical models, Computer models, Soils, Infiltration, Discharge(Water), Storage, Precipitation(Atmospheric), Rainfall, Land use, Remote sensing, Satellites(Artificial), Agriculture, Forests, Pollutants, Chemicals, Water chemistry, Analytical techniques, *Patuxent River(MD), *Prince George's County(MD), USDAHL model.

Prospective users of the USDAHL Model of Watershed Hydrology often think that inputs to the model are extremely difficult to obtain. This treatise was designed to illustrate some of the sources and labors required for inputs and to provide some measurements of the prognostication possibilities with this model. The example used was the Western Branch of the Patuxent River in Prince George's County, Maryland, above USGS streamgage No. 1594500 near Largo. This area was chosen because it has undergone considerable change in land use and urban development during the last decade. Also, the USGS has published a record of attending streamflow from this basin suitable for evaluating model outputs. Zoning is the first decision in applying USDAHL. For the single purpose of computing outflow from the watershed, zoning would be by soil types, by topography, or by land use, whichever varies the most drastically. The zone approach offers many possibilities in hydrology for chemical accounting. It permits isolation of a single feature of land use into a zone by itself. Combined with LANDSAT remote sensing of watershed features, USDAHL offers an expeditious means of deriving comprehensive estimates and greater vision of watershed hydrology as affected by land use and treatment. (See also W79-10107) (Sims-ISWS)
W79-10125

HYDROLOGIC DATA SOURCES,
Agricultural Research Center, Beltsville, MD. Hydrologic Data Lab.
For primary bibliographic entry see Field 7C.
W79-10126

A METHOD OF ESTIMATING PARAMETERS AND ASSESSING RELIABILITY FOR MODELS OF STEADY STATE GROUNDWATER FLOW 2. APPLICATION OF STATISTICAL ANALYSIS,
Geological Survey, Denver, CO. Water Resources Div.
R. L. Cooley.
Water Resources Research, Vol. 15, No. 3, p 603-617, June 1979. 10 fig, 6 tab, 22 ref.

Descriptors: *Groundwater movement, *Model studies, *Analytical techniques, *Aquifer characteristics, *Hydrogeology, Mathematical models, Physical properties, Permeability, Transmissivity, Groundwater recharge, Evaluation, Parameter estimation, Inverse problem.

Techniques of nonlinear regression were applied to estimate the hydrogeologic parameters (values of transmissivity or hydraulic conductivity), recharge, discharge, and boundary fluxes for steady-state ground-water flow models of two field areas: a cross section in the Hula Basin, Israel, and in Truckee Meadows, Nevada. Statistical techniques were used to estimate the degree of nonlinearity of the models, goodness of fit of the models to field data, and reliability of predictions to be made with the models. Analysis of goodness of fit included estimation of reliability and significance of computed parameters and reliability of the computed head distribution. Both cases analyzed behaved at least approximately linearly based on Beale's measure of nonlinearity; that variable reliability of observed head data had to be incorporated into the analysis for Truckee Meadows; that residuals, transformed to eliminate heteroskedasticity and intercorrelation, may be independently normally distributed in the case of Truckee Meadows (testing was not carried out for Hula Basin because of possible lack of model fit); and that standard errors for parameters for both cases were large, indicating nonuniqueness of the solution, even though model fit was good for Truckee Meadows and was fair for Hula Basin. Reliability of the predicted drawdown distribution and pumping rate was estimated for a gravel-pit operation in Truckee Meadows. In spite of the nonuniqueness problem, predictions of these quantities were not significantly different at a level of significance of 0.05 from the observed values. (See also W77-10008) (Woodard-USGS)
W79-10161

HYDROLOGIC EVALUATION OF THE ALTON RECLAMATION-STUDY SITE, ALTON COAL FIELD, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
G. W. Sandberg.
Geological Survey open-file report 79-346, 1979. 53 p, 5 fig, 8 tab, 7 ref.

Descriptors: *Baseline studies, *Water quality, *Groundwater, *Surface waters, *Land reclamation, Data collections, Hydrogeology, Streamflow, Sediment transport, Observation wells, Potentiometric level, Water levels, Irrigation wells, Aquifers, Test wells, Transmissivity, Evaluation, *Alton coal field(UT), Pre-strip mining.

An investigation was conducted from July 1974 to September 1977 to define general hydrologic conditions at a reclamation-study site in the Alton coal field near Kanab, Utah. The average annual streamflow through the area was less than 600 acre-feet, and the water carried little sediment except during floods which result from intense local storms. Most of the surface water seeps into the ground or is diverted for irrigation downstream from the study area. Ground-water data were insufficient to define the potentiometric surface in most of the area. The water level in each of the three observation wells is above the coal layer in the immediate area of the well. A larger network of wells is needed to define the potentiometric surface throughout the area and to show its relation to surface water and the location of the coal layers. Hydrologic data should be collected continuously to establish a hydrologic base before mining begins, and data collection should be continued through the periods of mining and reclamation. (Woodard-USGS)
W79-10166

EFFECTS OF PUMPING ON GROUNDWATER LEVELS NEAR TAYLORSVILLE, BATHOLOMEW COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
M. Planert, and P. Tucci.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-298 244, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 79-20, February 1979. 22 p, 12 fig, 7 ref.

Descriptors: *Model studies, *Drawdown, *Pumping, *Aquifer systems, *Water levels, Indiana, Groundwater movement, Hydrogeology, Observation wells, Hydrographs, Evaluation, *Continuous pumping, *Well field, *Bartholomew County(Ind).

A two-dimensional digital flow model was used to estimate the effects of continuous pumping of a public-supply well field on the ground-water levels near Taylorsville, Indiana. Results of the modeling showed that the water levels would decline from less than 1 to about 4.5 feet within the study area and a maximum of 1 to 2 feet in Taylorsville in response to a pumping rate of 700 gallons per minute. Model results also show that the groundwater system would reach steady state in approximately 5 years after pumping begins. Corrections applied to water-level declines indicated by the model, to account for the effects of partial penetration of the aquifer by wells, showed that these effects, although substantial in the pumping wells, are negligible 200 feet from the wells. (Woodard-USGS)
W79-10169

NOTE ON THE APPLICATION OF CLASSICAL EXTREME VALUE THEORY TO FLOOD DATA,
Otago Univ. (New Zealand). Dept. of Geography.
W. E. Bardsley.
Journal of Hydrology, Vol. 42, No. 1/2, p 195-198, June 1979. 10 ref.

Descriptors: *Annual flood, *Mathematical models, *Stochastic processes, Statistical methods, Analytical techniques, Floods, Hydrology, Watersheds(Basins), Distribution, Extreme value theory.

Todorovic and Zelenhasic and others have advocated the use of exact distributions of order statistics from random sample size to describe flood maxima from fixed time intervals. It was suggested in this paper that the asymptotic extreme value distributions are not necessarily inappropriate in this situation and possess some useful advantages over the exact distributions. (See also W71-03680 and W71-04590) (Humphreys-ISWS)
W79-10262

AREAL INTERPOLATION OF RAINFALL WITH A DOUBLE FOURIER SERIES,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
For primary bibliographic entry see Field 2B.
W79-10266

COLLINEARITY AND STABILITY IN THE ESTIMATION OF RAINFALL-RUNOFF MODEL PARAMETERS,
Iowa Univ., Iowa City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-10268

2B. Precipitation

WALKER BRANCH WATERSHED ELEMENT CYCLING STUDIES: COLLECTION AND ANALYSIS OF WETFALL FOR TRACE ELEMENTS AND SULFATE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2K.
W79-10092

PRECIPITATION AND NUTRIENT EXPORT FROM A SMALL COASTAL ECOSYSTEM IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.

For primary bibliographic entry see Field 2K.
W79-10093

HYDROLOGIC CHARACTERISTICS OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10095

DESCRIPTIVE HYDROLOGY OF THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10096

THE MAHANTANGO CREEK WATERSHED--GENERAL HYDROLOGY AND RESEARCH RESULTS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W79-10097

OBSERVATIONS ON THE WATER BALANCE FOR SEVEN SUB-BASINS OF RHODE RIVER, MARYLAND,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10099

THE APPLICATION OF ANALYTIC AND MECHANISTIC HYDROLOGIC MODELS TO THE STUDY OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10120

HYDROLOGIC DATA SOURCES,
Agricultural Research Center, Beltsville, MD. Hydrologic Data Lab.
For primary bibliographic entry see Field 7C.
W79-10126

OBSERVATIONS OF THE MORPHOLOGY OF MELTING SNOW,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2C.
W79-10243

HURRICANE SURGE POTENTIALS OVER SOUTHEAST LOUISIANA AS REVEALED BY A STORM-SURGE FORECAST MODEL: A PRELIMINARY STUDY,
National Weather Service, New Orleans, LA.
For primary bibliographic entry see Field 2L.
W79-10254

A HYDROLOGIC REANALYSIS OF THE LA PORTE ANOMALY,
Boston Univ., MA. Dept. of Geography.
R. R. Clark.
Bulletin of the American Meteorological Society, Vol. 60, No. 5, p 415-421, May 1979. 2 fig, 3 tab, 13 ref.

Descriptors: *Rainfall, *Distribution patterns, *Streamflow, *Indiana, Meteorological data, Hydrologic data, Data processing, Analytical techniques, Precipitation(Atmospheric), Discharge(Water), Rivers, River flow, Meteorology, Climatology, Hydrology, *La Porte(IN), *La Porte anomaly.

The 1929-64 precipitation record at La Porte was analyzed through the use of a budgetary hydrologic model. Pre- and postanomaly data allowed accurate estimation of stream discharge for the La Porte region, but use of the anomaly period data caused consistent significant overestimation of discharge. If both the La Porte data and the stream discharge data are accurate, then La Porte can only be a small-scale phenomenon, affecting a small portion of the basin. The post-1960 disappearance of the anomaly could be explained by the movement of a local anomaly, dissipation of the anomaly mechanism by a reduction of atmospheric particulates, or elimination of gage and/or observer error. Of the three, gage and/or observer error appears most likely to be the cause of the anomaly. (Sims-ISWS)
W79-10255

AREAL INTERPOLATION OF RAINFALL WITH A DOUBLE FOURIER SERIES,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
W. R. Thorpe, C. W. Rose, and R. W. Simpson.
Journal of Hydrology, Vol. 42, No. 1/2, p 171-177, June 1979. 2 fig, 1 tab, 7 ref.

Descriptors: *Rainfall disposition, *Mathematical models, *Australia, *Watersheds(Basins), Rainfall, Areal, Fourier analysis, Isohyets, Analytical techniques, Algorithms, Spatial distribution, Distribution patterns, Double Fourier method.

The double Fourier method described was shown to provide a more accurate estimate of catchment rainfall than the Thiessen method when applied to a particular, analytically defined rainfall distribution. The procedure also overcomes the objection of Edwards to a previous method of James in that dense raingauge networks are not usually required since it provides an objective method of fitting surfaces to less than 9 data points. (See also W75-04693) (Humphreys-ISWS)
W79-10266

2C. Snow, Ice, and Frost

OBSERVATIONS OF THE MORPHOLOGY OF MELTING SNOW,
National Center for Atmospheric Research, Boulder, CO.
C. A. Knight.
Journal of the Atmospheric Sciences, Vol. 36, No. 6, p 1123-1130, June 1979. 7 fig, 17 ref.

Descriptors: *Snow, *Melting, *Cloud physics, Data collections, Sampling, On-site investigations, Laboratory tests, Photography, Crystals, Snowfall, Precipitation(Atmospheric), Meteorology, Snow morphology.

The forms of snow crystals and flakes in various stages of melting can be observed with substantial fidelity after collecting the particles in subfreezing hexane. These forms are largely determined by minimum surface area considerations, which can lead to the breakup of some forms. The collection method might be useful in detailed studies of the radar bright band. (Sims-ISWS)
W79-10243

2D. Evaporation and Transpiration

OBSERVATIONS ON THE WATER BALANCE FOR SEVEN SUB-BASINS OF RHODE RIVER, MARYLAND,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10099

A SOIL-PLANT-ATMOSPHERE MODEL FOR TRANSPIRATION AND AVAILABILITY OF SOIL WATER,
Northeastern Forest Experiment Station, Durham, NH.
C. A. Federer.
Water Resources Research, Vol. 15, No. 3, p 555-562, June 1979. 3 fig, 2 tab, 27 ref.

Descriptors: *Transpiration, *Soil water, *Model studies, Soil types, Soils, Soil-water-plant relationships, Internal water, Hardwood, Stomata, *Soil water potentials, Vapor flux, Stomatal response, Internal resistance, Hardwood forest, Potential gradient, Soil water content, Plant behavior.

In a soil-plant-atmosphere model, the soil was divided into several layers with different root densities and soil water potentials, but the aboveground portion was represented by single values both of diffusive resistance and of plant water potential. The model used Cowan's theory for root uptake, Monteith's combination equation for vapor flux, constant internal resistance per unit of root length, and stomatal response to light, humidity, temperature, and plant water potential. For forests, unstressed transpiration, defined as the transpiration that would occur if stomatal opening were not reduced by low plant water potential, may be a more useful value than potential evapotranspiration. The model simulated field data from a hardwood forest in terms of both plant water potential and stomatal behavior within a day and over a summer. Stomata had a threshold type of response to plant water potential, with closure occurring as plant water potential approached a critical potential. Internal resistance was high enough that when unstressed transpiration was high, plant water potential became low enough to cause some stomatal closure and reduce transpiration even when soil was wet. (Roberts-ISWS)
W79-10247

ESTIMATION OF THE ISOTOPIC COMPOSITION OF LAKE EVAPORATE,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 7C.
W79-10267

2E. Streamflow and Runoff

DRAINAGE BASIN RESEARCH IN EASTERN NORTH AMERICA,
National Science Foundation, Washington, DC. Div. of Advanced Environmental Research and Technology.
E. H. Bryan.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 1-3, 1977.

Descriptors: *Watersheds(Basins), *Chesapeake Bay, *Conferences, *Research and development, *Northeast US, Drainage, Water quality, Water pollution, Water pollution sources, Environment, Research priorities.

This introductory address reviewed the drainage basin research in the eastern United States supported by the National Science Foundation and by the Environmental Protection Agency. Research of the Chesapeake Bay drainage basins was emphasized. The need for workshops and conferences was described. (See also W79-10084) (Sims-ISWS)
W79-10085

LAKE JACKSON WATERSHED STUDY: DESCRIPTION OF SITES, METHODOLOGY AND SCOPE OF RESEARCH,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10087

AN OVERVIEW OF THE CHOWAN RIVER RURAL RUNOFF STUDY,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W79-10088

WATERSHED RESEARCH IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-10089

THE MAHANTANGO CREEK WATERSHED--AN INTERDISCIPLINARY WATERSHED RESEARCH PROGRAM IN PENNSYLVANIA,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W79-10090

AN OVERVIEW OF THE RHODE RIVER WATERSHED PROGRAM,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10091

HYDROLOGIC CHARACTERISTICS OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10095

DESCRIPTIVE HYDROLOGY OF THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10096

OBSERVATIONS ON THE WATER BALANCE FOR SEVEN SUB-BASINS OF RHODE RIVER, MARYLAND,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10099

NUTRIENT DISCHARGE FROM RHODE RIVER WATERSHEDS AND THEIR RELATIONSHIP TO LAND USE PATTERNS,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10105

PATTERNS OF ORGANIC MATTER TRANSPORT ON WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10106

DYNAMICS OF TRACE ELEMENT EXPORT FROM A DECIDUOUS WATERSHED, WALKER BRANCH, TENNESSEE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-10116

LAND UTILIZATION AND METALS DISCHARGE FROM THE RHODE RIVER WATERSHED,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10117

THE APPLICATION OF ANALYTIC AND MECHANISTIC HYDROLOGIC MODELS TO THE STUDY OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10120

PROBABILITY SAMPLING OF SMALL STREAMS: PROBLEMS AND RESULTS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
For primary bibliographic entry see Field 7B.
W79-10122

HYDROLOGIC DATA SOURCES,
Agricultural Research Center, Beltsville, MD. Hydrologic Data Lab.
For primary bibliographic entry see Field 7C.
W79-10126

LOW-FLOW CHARACTERISTICS OF ALABAMA STREAMS,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
R. H. Bingham.
Alabama Geological Survey Division of Water Resources Bulletin 117, 1979. 39 p, 9 fig, 1 plate, 10 ref.

Descriptors: *Low flow, *Base flow, *Alabama, *Streams, *Natural flow, Estimating, Flow rates, Analytical techniques, Regression analysis, Flow characteristics, Hydrologic data, Surface-groundwater relationships, Aquifer characteristics, Groundwater movement, Hydrogeology.

A new procedure for estimating the 7-day 2-year and the 7-day 10-year low flow of ungaged Alabama streams is based on geology, drainage area, and mean annual precipitation. One equation for each of the two low-flow frequencies applies statewide to all natural flow streams; the equations do not apply to streams where flow is significantly altered by activities of man. The standard error of estimate of each equation based on map values is 40 percent for 7-day 2-year, and 44 percent for 7-day 10-year low flow. Examples of using the new estimating procedures are given. The rate of streamflow recession is used to account for the effects of geology on low flow. Streamflow recession rate depends primarily on transmissivity and storage characteristics of the aquifers, and average distance from stream channels to divides. Relations of low-flow discharge to geology, drainage area, and mean annual precipitation were analyzed by multiple regression techniques. Data used in the regressions are included. (Woodard-USGS)
W79-10181

QUANTITATIVE DESCRIPTION OF DEPRESSION STORAGE USING A DIGITAL SURFACE MODEL, I. DETERMINATION OF DEPRESSION STORAGE,
Guelph Univ. (Ontario). School of Engineering.
W. Ullah, and W. T. Dickinson.
Journal of Hydrology, Vol. 42, No. 1/2, p 63-75, June 1979. 4 fig, 1 tab, 20 ref.

Descriptors: *Depression storage, *Topography, *Photogrammetry, *Computer programs, *Data processing, Storage capacity, Numerical analysis, Surface drainage, Surfaces, Topology, Digital data, Tilled land.

Depression storage is a dominating storage element which accounts for most of the retention on a watershed surface. Because of practical difficulties in making direct measurement of the dimensions of individual depressions, the values of depression storage have either been assumed or indirectly estimated. The physical properties of a surface in terms of depression storage depend upon the surface configuration which can be modelled with a set of elevation values given as a function of horizontal coordinates. These values constitute a digital surface model. A photogrammetric technique has been used to develop digital surface models for 15 sample plots, of about 160 cm x 200 cm size, having similar physiographic conditions. A simple digital technique was developed and used to determine the geometric properties of individual depressions of all sample plots. The method scans the digital surface model and identifies characteristic points of depressions such as low points, pour points, etc. The information obtained in the process was used to compute the geometric properties of depressions, depth, surface area, and volume. (See also W79-10239) (Adams-ISWS)
W79-10238

QUANTITATIVE DESCRIPTION OF DEPRESSION STORAGE USING A DIGITAL SURFACE MODEL, II. CHARACTERISTICS OF SURFACE DEPRESSIONS,
Guelph Univ. (Ontario). School of Engineering.
W. Ullah, and W. T. Dickinson.
Journal of Hydrology, Vol. 42, No. 1/2, p 77-90, June 1979. 8 fig, 2 tab, 6 ref.

Descriptors: *Depression storage, *Topography, *Statistical methods, *Regression analysis, Correlation analysis, Geomorphology, Hydrology, Equations, Surface drainage, *Weibull distribution.

Results of analysis of data of volume, depth, and surface area of individual depressions were presented. The spatial distribution of depressions was found to be both random and direction oriented. Depression storage volume decreases with the slope of the plot due to a reduction in both the number of depressions and the dimensions of individual depressions. The three geometric properties depth, surface area, and volume are also related to each other. The geometric properties of the depressions exhibit a frequency distribution of somewhat similar characteristicity. The observed frequency distribution can be satisfactorily described by the Weibull distribution. (See also W79-10238) (Adams-ISWS)
W79-10239

HURRICANE SURGE POTENTIALS OVER SOUTHEAST LOUISIANA AS REVEALED BY A STORM-SURGE FORECAST MODEL: A PRELIMINARY STUDY,
National Weather Service, New Orleans, LA.
For primary bibliographic entry see Field 2L.
W79-10254

A HYDROLOGIC REANALYSIS OF THE LA PORTE ANOMALY,
Boston Univ., MA. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W79-10255

THE EXTREME-VALUE TYPE-1 DISTRIBUTION AND THE PRINCIPLE OF MAXIMUM ENTROPY,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
P. W. Jowitt.
Journal of Hydrology, Vol. 42, No. 1/2, p 23-38, June 1979. 1 tab, 13 ref.

Descriptors: *Floods, *Theoretical analysis, *Mathematical models, *Mathematical studies, Stochastic processes, Annual flood, Statistical methods, Hydrology, Distribution, Probability, Mathematics, Algorithms, Extreme values, Annual maximum floods.

The properties and problems in parameter estimation of the extreme-value type 1 (EV1) distribution were discussed and then further examined using the principle of maximum entropy. This emerging concept points to a unique technique for the parameter estimation and provides the necessary justification for Kimball's method over maximum likelihood. The maximum likelihood estimators were shown to be equivalent for large sample sizes only. A simple algorithm for this parameter estimation technique was presented and illustrated using an historical record of annual maximum floods. The algorithm provided rapid convergence when applied to an actual set of annual maximum flood statistics. (Humphreys-ISWS)
W79-10263

LIMITED CONFIDENCE IN CONFIDENCE LIMITS DERIVED BY OPERATIONAL STOCHASTIC HYDROLOGIC MODELS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
V. Klemes, and A. Bulu.
Journal of Hydrology, Vol. 42, No. 1/2, p 9-22, June 1979. 5 fig, 4 tab, 17 ref.

Descriptors: *Hydrologic data, *Statistical methods, *Streamflow, *Time series analysis, *Hydrologic properties, Correlation analysis, Stochastic processes, Hydrology, Probability, Model studies, Probability density functions, Annual flow series, Statistical parameters.

A split-sample experiment involving the derivation of confidence limits for various statistical param-

eters by 3 different operational stochastic models fitted to a 25-year segment of a 100 year long series of mean monthly flows and a subsequent comparison of these limits with the parameters for the 3 remaining 25-year segments of the historic series led to the conclusion that only limited confidence in the confidence limits of hydrologic models is warranted. (Adams-ISWS)
W79-10264

APPLICATION OF THE AUTORUN TEST TO HYDROLOGIC DATA,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
Z. Sen.
Journal of Hydrology, Vol. 42, No. 1/2, p 1-7, June 1979. 2 fig, 1 tab, 6 ref.

Descriptors: *Persistence, *Hydrologic properties, *Statistical methods, *Time series analysis, Hydrology, Statistics, Rivers, Equations, Correlation analysis, Probability, Streamflow, On-site tests, Autorun test, Independent series, Dependent series.

The statistical test referred to as the autorun test was described. This test was used to determine whether a data series is independent or dependent. The test was applied to annual series of 8 rivers with records from 34 to 150 years long. One illustration of the application of the test on a monthly flow series also was given. (Adams-ISWS)
W79-10265

COLLINEARITY AND STABILITY IN THE ESTIMATION OF RAINFALL-RUNOFF MODEL PARAMETERS,
Iowa Univ., Iowa City. Dept. of Civil Engineering.
P. K. Kitanidis, and R. L. Bras.
Journal of Hydrology, Vol. 42, No. 1/2, p 91-108, June 1979. 4 fig, 6 tab, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Runoff, Equations, Parametric hydrology, Stability, Statistical models, Statistical methods, Hydrology, Rivers, Algorithms, Flow, Filters, Parameter estimation, Collinearity, Kalman filter.

The common use of statistical rainfall-runoff models of the regressive type leads to the problem of handling the unavoidable correlation existing between the explanatory variables of these models. The above collinearity problem was treated using ridge regression techniques. This powerful regression method was extensively presented and discussed. Examples showed that collinearity has significant effects on values of rainfall-runoff model parameters and that ridge regression effectively deals with the problem, leading to well-behaved model coefficients. The important issue of parameter stability was also addressed using both ridge regression and Kalman filtering as estimation procedures. It was shown that considerable data are required before parameter stability is achieved, casting serious doubts on the predictive capability of models developed with usually limited historical data. Although a powerful methodology, Kalman filtering exhibited disturbing instability and lack of convergence unless special algorithms of high numerical accuracy were used. (Lee-ISWS)
W79-10268

2F. Groundwater

THE MAHANTANGO CREEK WATERSHED--EVALUATING THE SHALLOW GROUNDWATER REGIME,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
J. B. Urban.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 251-276, 1977. 10 fig, 14 ref.

Descriptors: *Watersheds(Basins), *Groundwater, *Hydrogeology, Geology, Stratigraphy, Instrumentation, Water levels, Water level fluctuations, Groundwater movement, Recharge, Specific capacity, Transmissivity, Travel time, Wells, Water wells, Pumping, Drawdown, Precipitation(Atmospheric), Rainfall, Hydrology, *Mahantango Creek Watershed(PA).

The groundwater in the Mahantango Creek Watershed exists as a layered system of perched and regional groundwater. The perched groundwater is in a zone of rock fracturing ranging from 1 to 10 meters deep. The perched groundwater merges with fragipan soil water and the regional groundwater near the prominent small streams. Groundwater levels respond to precipitation from within minutes to hours. Most groundwater recharge occurs during the dormant season, but occasional wet periods during the summer can result in small recharge events. Water level trends indicate that the groundwater is in a steady-state condition in terms of years but not seasonally. Groundwater divides occur at topographic divides; no watershed losses are likely in the Mahantango Creek portion of the watershed. Pumping of the groundwater wells in the area, both research wells and homeowner wells, indicates that wells in sandstone or siltstone in the bottom-land areas of the watershed are the highest yielding. Specific capacity is used as an index to rate the water yield potential of wells in various topographic settings and rock types. Specific capacities are converted to transmissivity or permeability, and potential groundwater velocities are calculated which indicate that groundwater velocities can be expected to range from 0.003 meter per day or less to 0.9 meter per day at unit gradient and from 0.0003 to 0.09 at field water table gradients. (See also W79-10084) (Sims-ISWS)
W79-10098

THE APPLICATION OF ANALYTIC AND MECHANISTIC HYDROLOGIC MODELS TO THE STUDY OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10120

COMMENT ON 'GOVERNING EQUATIONS FOR GEOTHERMAL RESERVOIRS' BY D. H. BROWNELL, S. K. GARG, AND J. W. PRITCHETT,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 1A.
W79-10160

A METHOD OF ESTIMATING PARAMETERS AND ASSESSING RELIABILITY FOR MODELS OF STEADY STATE GROUNDWATER FLOW 2. APPLICATION OF STATISTICAL ANALYSIS,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2A.
W79-10161

EFFECTS OF PUMPING ON GROUNDWATER LEVELS NEAR TAYLORSVILLE, BATHOLOMEW COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2A.
W79-10169

GROUND WATER RESOURCES OF GEORGIA,
Georgia Univ., Athens. Inst. of Government.
J. E. Kundell.
1978. 139 p, 15 fig, 6 tab, 20 ref, 1 append.

Descriptors: *Groundwater resources, *Aquifers, *Legislation, *Georgia, Groundwater availability, Hydrologic cycle, Sand aquifers, Topography, Water quality, Legal aspects, Artesian aquifers, Aquifer characteristics, Water yield, Water rights, Regulation, Water pollution, Water pollution sources, Coastal plains, Groundwater movement.

This report was designed to provide a base of information on the groundwater resources of Georgia and to point out current problems. Major aquifers described included shallow sand and recent deposits, principal artesian, Claiborne, Clayton, Cretaceous, Piedmont, Blue Ridge, and Northwest Georgia. Limited data were presented for each aquifer. Although the Geological Survey has been able to model the groundwater resource in the Savannah and Brunswick areas, the nature of the resource in much of the rest of the state is still not sufficiently understood. Therefore, research is needed to provide the facts upon which decisions can be based. Problem areas identified in this study included: (1) Savannah and Chatham County, (2) Brunswick and Glynn County, (3) Southwest Georgia, (4) The Gulf trough, (5) The Valdosta area, and (6) Northwest Georgia. Activities of the courts in dealing with groundwater issues are nearly nonexistent. A number of laws relating to both surface and groundwater use were discussed. Major acts impacting upon water include the following: (1) The Georgia Water Quality Control Act of 1964, (2) The Underground Gas Storage Act of 1965, (3) The Ground Water Use Act of 1972, (4) The Oil and Gas and Deep Drilling Act of 1975, (5) The Water Well Standards Act of 1976, (6) The Georgia Safe Drinking Water Act of 1977, and (7) The Water Conservation Plumbing Act of 1977. Copies of these laws were included in the Appendix. Two state agencies hold primary responsibility for groundwater use. The Geologic and Water Resources Division of the Department of Natural Resources works closely with the Geological Survey in researching the groundwater system of Georgia. The Environmental Protection Division of the Department of Natural Resources is the regulatory agency charged with protecting the water resources. Activities of these agencies were discussed. (Humphreys-ISWS)
W79-10241

THE USE OF A GAMMA LOGGER TO DELINEATE GLACIAL AND BEDROCK STRATIGRAPHY IN SOUTHWESTERN OHIO,
Miami Univ., Oxford, OH. Dept. of Geology.
A. D. Baldwin, Jr., and J. Miller.
Ground Water, Vol. 17, No. 4, p 385-389, July-August 1979. 5 fig, 3 ref.

Descriptors: *Gamma rays, *Glaciology, *Glacial sediments, *Ohio, Glacial drift, Glacial aquifers, Bedrock, Till, Sands, Stratigraphy, *Gamma logger, *Glacial stratigraphy, Bedrock stratigraphy, Gamma ray logger, Uplands, Glacial outwash aquifer, Till sheets, Cincinnatian series.

An evaluation was made of the usefulness of the gamma-ray logger in delineating glacial-drift and bedrock stratigraphy in southwestern Ohio. The logger was useful in delineating gross stratigraphic units in the glacial outwash aquifer. The gamma log also provided a clearer indication of the clay content of sand and gravel units than did the driller's log. On the uplands, away from the valleys filled with glacial outwash, the logger could not be used to locate the thin, poorly-sorted, interstadial sand and gravel deposits between thicker till sheets. However, it could be used to distinguish formational contacts in the upper Cincinnatian Series. (Roberts-ISWS)
W79-10246

2G. Water In Soils

SOIL WATER AND CHEMICAL MOVEMENT IN A SLOPING FRAGIPAN SYSTEM,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
W. R. Heald, and A. S. Rogowski.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 385-399, 1977. 9 fig, 1 tab, 7 ref.

Descriptors: *Soil water movement, *Chemicals, *Path of pollutants, Soil water, Chemical analysis, Nitrates, Chlorides, Magnesium, Potassium,

Sodium, Electrical conductance, Moisture content, Water table, Evapotranspiration, Wells, Water wells, Instrumentation, Sampling, On-site investigations, Model studies, *Mahantango Creek(PA).

Researchers studying problems involving water flow in the field generally hope that water contents and gradients measured in situ will agree with the theoretical predictions. However, as the size of the study area and the complexity of flow increase, numerous simplifying assumptions are usually required. Frequently, additional information may be available that is not fully utilized. This study attempted to show how such information, in this case results based on chemical analysis of soil water samples, can be used to complement hydrologic findings. (See also W79-10084) (Sims-ISWS)
W79-10103

COMPARISON OF THREE FIELD METHODS FOR DETERMINING SATURATED HYDRAULIC CONDUCTIVITY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
D. W. DeBoer.
Transactions of the American Society of Agricultural Engineers, Vol. 22, No. 3, p 569-572, May-June 1979. 2 fig, 2 tab, 19 ref.

Descriptors: *Hydraulic conductivity, *Saturated flow, *Soil water, Irrigation, On-site investigations, Drainage, Porosity, Soil water movement, Water table, Analytical techniques, Methodology, Soils, Agriculture.

Pump-in, auger hole, and drain line methods were used to estimate the saturated hydraulic conductivity of a 1.0 ha experimental area. The pump-in value was about 1/2 the auger hole value. A composite pump-in value for the layered soil profile was about equal to the drain line value. (Sims-ISWS)
W79-10250

NEMATICIDE DISTRIBUTION UNDER A DRIP EMITTER,
Georgia Cooperative Extension Service, Attapulgus.
P. M. Garvey, J. L. Chesness, and U. E. Brady.
Transactions of the American Society of Agricultural Engineers, Vol. 22, No. 3, p 546-548, May-June 1979. 3 fig, 1 tab, 17 ref.

Descriptors: *Nematocides, *Infiltration, *Distribution patterns, Peaches, Pesticides, Nematodes, Soils, Soil water, Soil water movement, Irrigation, Spatial distribution, Wetting, Agriculture, On-site investigations, Drip emitters.

Distribution of nematicide in the soil when applied at different concentrations through a drip irrigation emitter was studied. Concentrations of 30, 800, and 1500 ppm were used, and soil volumes exposed to lethal concentrations of the nematicide were determined for each. (Sims-ISWS)
W79-10251

2H. Lakes

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME I, FEBRUARY 28-MARCH 3, 1977.
For primary bibliographic entry see Field 2A.
W79-10084

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME II, FEBRUARY 28-MARCH 3, 1977.
For primary bibliographic entry see Field 2A.
W79-10107

BEHAVIOR OF MAJOR SOLUTES DURING CLOSED-BASIN BRINE EVOLUTION,
Johns Hopkins Univ. Baltimore, MD. Dept. of Earth and Planetary Sciences; and Geological Survey, Reston, VA. Water Resources Div.
H. P. Eugster, and B. F. Jones.
American Journal of Science, Vol. 279, p 609-631, June 1979. 25 fig, 1 tab, 50 ref.

Descriptors: *Water chemistry, *Solutes, *Lake basins, *Chemical reactions, Sorption, Physical properties, Chemical properties, Sediments, Salinity, Evaluation, *Closed basins.

The pronounced chemical fractionation which takes place in hydrologically closed basins between dilute inflow and concentrated brines can be accounted for by a variety of mechanisms. These include mineral precipitation, selective dissolution of efflorescent crusts and sediment coatings, surface sorption on active surfaces, degassing, and redox reactions. Major solutes are differentially affected by these mechanisms and their response may differ from basin to basin. Using data from Lake Magadi, Kenya; Lake Abert, Oregon; Devils Lake, North Dakota; Deep Springs Lake, California; Basque Lake, British Columbia; and Great Salt Lake, Utah; some of these differences can be delineated. In most of these systems, chloride behaves as a conservative element and can be used to monitor the progress of evaporative concentration; (Ca + Mg) are removed from solution principally by mineral precipitation, commonly involving carbonate minerals. Carbonate species are depleted through mineral precipitation, degassing, and selective dissolution of efflorescent crusts. The fractionation between Na and K is pronounced in the inflow waters of all but one of the closed basins, with Na being enriched over K in solution up to 100-fold. Surface sorption and bacterial reduction appear to be the principal processes for sulfate fractionation from closed basin saline waters. In more concentrated brines, sulfate often accumulates until saturation with respect to sodium sulfate minerals is reached. (Woodard-USGS)
W79-10172

2I. Water In Plants

A REVIEW OF THE BIOLOGY, ECOLOGY, AND MANAGEMENT OF SCIRPUS OLNEYI: VOLUME II: A SYNTHESIS OF SELECTED REFERENCES,
Maryland Dept. of Natural Resources, Annapolis. Wetlands Permit Div.
W. S. Sipple.
Wetland Publication No. 4, September 6, 1979. 85 p.

Descriptors: *Bulrushes, *Ecology, Management, Distribution, Genetics, Reproduction, Soils, Succession, Growth and development, Physical and biological impacts, Morphology, Physiology, Taxonomy, Ontogeny.

This synthesis of selected references on Scirpus olneyi incorporates information from most of references cited in Volume I (An Annotated Bibliography of Selected References) as well as information from additional references. A total of 185 references are cited. There are sections on biology, ecology, and management. The biology section includes information on geographical distribution, taxonomy, genetics, anatomy, morphology, reproduction, and growth and development. The ecology section includes information on general habitat, vegetation types and structure, successional relationships, physical and chemical factors affecting plant growth and development, soils, and standing crop of biomass. The management section includes information on artificial plant establishment, seed collection, seed handling and storage, control of plant competition, physical impacts, biological impacts, and importance to wildlife. (See also W79-02110)
W79-10185

2J. Erosion and Sedimentation

THE MAHANTANGO CREEK WATERSHED--SOURCE AND REACTION OF PHOSPHATE DURING STORM HYDROGRAPHS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5B.
W79-10104

SUSPENDED AND DISSOLVED SOLIDS EXPORTS FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
T. M. Burton, R. R. Turner, and R. C. Harriss.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 471-485, 1977. 1 fig, 6 tab, 10 ref.

Descriptors: *Watersheds(Basins), *Florida, *Demonstration watersheds, *Sediment transport, Suspended solids, Land use, Agricultural watersheds, Dissolved solids, On-site data collections, On-site investigations, Water sampling, Analysis, Particle size, Organic matter, Sediment discharge, Water quality, Urban watersheds, Volatile solids.

Exports of suspended (SS), volatile suspended (VSS), dissolved (DS), and volatile dissolved (VDS) solids from three north Florida watersheds were monitored from 1973 to 1975. The forested-agricultural watershed exported 40 kg/ha/yr SS, 11 kg/ha/yr VSS, 71 kg/ha/yr DS, and 29 kg/ha/yr VDS. There was a 126-fold increase in sediment exports from the urban watershed, a 28-fold increase in VSS exports, a 6-fold increase in DS, and a 4-fold increase in VDS compared to the forested-agricultural watershed. The low density suburban watershed exported intermediate amounts of all solids, but these increases were attributable primarily to highway construction within the watershed and are not typical of highly forested, low residential areas. The dramatically increased sediment losses resulted in large increases in total and particulate phosphorus exports. Corrective measures to minimize losses from the urban watershed have been undertaken and were discussed briefly. (See also W79-10107) (Humphreys-ISWS)
W79-10108

DISCHARGE OF SUSPENDED PARTICULATES FROM RHODE RIVER SUBWATERSHEDS,
Smithsonian Institution, Washington, DC. Div. of Sedimentology.
J. W. Pierce, and F. T. Dulong.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 531-553, 1977. 7 fig, 5 tab, 32 ref. EPA R804536-01, SRF 460126.

Descriptors: *Sediment discharge, *Watersheds(Basins), *Chesapeake Bay, *Maryland, Streams, On-site investigations, Suspended solids, Erosion rates, Sampling, Discharge(Water), Measurement, Streamflow, Rainfall, Data collections, *Rhode River(MD), Solids concentration.

Discharge of total particulate material, as well as the mineral and organic phases constituting the total, from a portion of the watershed into the Rhode River has been monitored for 3 years. There were 5 monitored streams at the end of 1974 and 11 at the end of 1976. Composited, flow-integrated samples were acquired weekly from each weir. Concentrations of solids ranged over 3 orders of magnitude. Discharge of solids past the different weirs ranged from a low of 7.5 metric tons to over 115 metric tons per year. On a unit area basis the annual discharge ranged from 45 kg/ha to over 511 kg/ha. Erosion rates ranged from 0.45 cm/1000 years to slightly over 5 cm/1000 years. Little change was noted in the mineralogy of the suspended particles except for an increase in quartz and feldspar during periods of high water discharge. Monitoring of one storm event on two streams indicated that spot samples give poor estimates of discharge. Over 97% of the weekly discharge occurred during 24 hours of storm runoff; 92% in 12 hours. The weekly flow-integrated concentration and average flow rate occurred during

40 minutes and 65 minutes, respectively, of the entire week but did not occur at the same time. Coring of the sediment deposit in the basin behind one weir suggested that channel storage is relatively insignificant on small streams over the long term. As much as 9 times the volume of possible stored material was discharged past the weir over a period of 1.5 years. (See also W79-10107) (Humphreys-ISWS)
W79-10110

MODELING SEDIMENT TRANSPORT IN NATURAL CHANNELS,
Hydrocomp, Inc., Palo Alto, CA.
R. C. Johanson, and K. M. Leytham.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 861-885, 1977. 5 fig, 24 ref.

Descriptors: *Sediment transport, *Channels, *Pollutants, *Model studies, Mathematical models, Sediments, Clays, Silts, Soils, Sands, Organic matter, Colloids, Scour, Deposition(Sediments), Chemicals, Water quality.

This article discussed some of the problems which must be addressed when modeling the transport of sediment from the perspective of pollutant studies. The role played by colloidal material in conveying pollutants was stressed. A sediment transport model being developed by Hydrocomp, Incorporated, for the Environmental Protection Agency was outlined. The concepts and constructs which were used to represent the behavior of mixtures of cohesionless and cohesive sediments were presented. Some questions were posed which must be answered if significant progress is to be made in this field. (See also W79-10107) (Sims-ISWS)
W79-10124

RELATION OF SEDIMENT YIELD TO CLIMATIC AND PHYSICAL CHARACTERISTICS IN THE MISSOURI RIVER BASIN,
Geological Survey, Lawrence, KS. Water Resources Div.
P. R. Jordan.
Geological Survey Water-Resources Investigations 79-49, March 1979. 26 p, 1 fig, 7 tab, 22 ref.

Descriptors: *Sediment transport, *Streamflow, *Sediment yield, *Reservoir silting, *Missouri River, Basins, Hydrologic data, Sediment load, Forecasting, Regression analysis, Evaluation.

Data from 64 stream-sediment stations and reservoirs in the plains area and from 15 stream-sediment stations in the mountainous area of the Missouri River basin were analyzed to determine the relation of sediment yield to basin characteristics. Data from each sediment station and reservoir represented at least 7 years of sediment discharge in the plains area or 4 years of sediment discharge in the mountainous area. Results of the analysis show the approximate relations of sediment yield to basin characteristics in the plains area, but data for the mountainous area are insufficient to show any significant relation. In the plains area the sediment yield was most closely related to contributing drainage area, mean streamflow, average thickness of loess, and average land slope. A regression equation, using these characteristics, estimates sediment yields with a standard error of +142 percent and -59 percent. The relation of sediment yield to size of drainage area was consistent with the relation found earlier for the upper Mississippi River basin. (Woodard-USGS)
W79-10179

FILTRATION OF SEDIMENT BY SIMULATED VEGETATION I. STEADY-STATE FLOW WITH HOMOGENEOUS SEDIMENT,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W79-10252

2K. Chemical Processes

WALKER BRANCH WATERSHED ELEMENT CYCLING STUDIES: COLLECTION AND ANALYSIS OF WETFALL FOR TRACE ELEMENTS AND SULFATE,
Oak Ridge National Lab., TN.
S. E. Lindberg, R. R. Turner, N. M. Ferguson, and D. Matt.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 125-151, 1977. 2 fig, 9 tab, 40 ref.

Descriptors: *Rainfall, *Chemistry of precipitation, *Chemical analysis, *Trace elements, *Tennessee, Precipitation(Atmospheric), Chemistry, Sampling, Data collections, Equipment, Instrumentation, Analytical techniques, Cadmium, Manganese, Lead, Zinc, Sulfur, Chemicals, Pollutants, Water pollution, Air pollution, Watersheds(Basins), *Walker Branch Watershed(TN).

A precipitation sampling network designed specifically to optimize sample collection and handling for trace analysis has been established at Walker Branch Watershed, Tennessee, to accurately quantify the atmospheric input of trace elements. The network consists of 6 rain activated wetfall collectors of the AEC-HASL design which have been modified with respect to construction materials and arrangement of components in order to minimize trace element contamination. Wetfall has been collected through a combination of event and continuous sampling at 4 throughfall, 1 ground level incident, and 1 above canopy incident precipitation sites. Trace metal analyses were performed by graphite furnace atomic absorption spectroscopy without preconcentration to reduce the chance of contamination. Sulfate-S was determined by a modified methylthymol blue technique. Preliminary data for water year 1975-76 yielded weighted mean concentrations (and coefficients of variation) for Cd, Mn, Pb, Zn, and SO4-S in incident precipitation as 0.89 (108%), 1.5 (97%), 5.5 (54%), 7.1 (111%), and 840 (48%) micrograms/liter, respectively. For storm events, spatial effects on incident and throughfall rain chemistry were significant. Temporal effects on chemistry were also significant at some incident and throughfall sites. In comparison with published trace element concentrations in rain, the levels at WBW were closer to those measured at rural and remote forested locations than those observed near industrial or urban centers. (See also W79-10084) (Sims-ISWS)
W79-10092

PRECIPITATION AND NUTRIENT EXPORT FROM A SMALL COASTAL ECOSYSTEM IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
W. C. Hart, and J. G. Ogden, III.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 153-167, 1977. 1 fig, 3 tab, 17 ref.

Descriptors: *Chemistry of precipitation, *Rainfall, *Chemicals, *Canada, Ions, Nutrients, Sampling, Chemical analysis, Data processing, Nitrogen, Sodium, Phosphorus, Calcium, Chlorine, Potassium, Pollutants, Air pollution, Water pollution, Path of pollutants, *Nova Scotia.

Ionic budgets for a bog-pond complex near Halifax, Nova Scotia, were compared with ionic inputs via atmospheric precipitation. Based on three years of atmospheric precipitation sampling and lake water surface collected 15 years apart, it appears that the chemistry of regional precipitation in Nova Scotia had not changed between 1957 and 1974. (See also W79-10084) (Sims-ISWS)
W79-10093

NUTRIENT LOADING OF THE RHODE RIVER WATERSHED VIA LAND USE PRACTICE AND PRECIPITATION,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10094

NUTRIENT DISCHARGE FROM WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-10100

NUTRIENT EXPORT FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W79-10101

NUTRIENT YIELD ASSESSMENT BY DIFFERENT SAMPLING STRATEGIES,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W79-10102

SOIL WATER AND CHEMICAL MOVEMENT IN A SLOPING FRAGIPAN SYSTEM,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2G.
W79-10103

GEOCHEMISTRY OF GROUND WATER ASSOCIATED WITH TUFFACEOUS ROCKS, OASIS VALLEY, NEVADA,
Geological Survey, Lakewood, CO. Water Resources Div.
A. F. White.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $1.50. Geological Survey Professional Paper 712-E, 1979. 25 p, 13 fig, 7 tab, 40 ref.

Descriptors: Geochemistry, *Chemical reactions, *Hydrogeology, *Water chemistry, *Groundwater movement, Observation wells, Rhyolites, Evapotranspiration, Chemistry of precipitation, Kinetics, Radioactive dating, Fluorides, Model studies, *Volcanic glass, *Tuffaceous rocks, *Oasis Valley(NV), *Nevada nuclear test sites.

Field sampling of springs and wells in Oasis Valley, Nev., provided information on the hydrologic and geochemical kinetic and solubility controls on the solute chemistry of the ground water. High dissolved sodium and silica associated with the tuffaceous aquifer indicate that hydrolysis and incongruent dissolution of rhyolitic glass are the principal reactions. Resultant dominant product phases, based on stability calculations, are montmorillonite and amorphous silica. Ground water infiltrates the valley alluvium from the tuffaceous aquifer through springs and subsurface flow. Colinear increases in sodium, bicarbonate, and chloride suggest that ground water in both aquifers has the same origin and that concentration increases in the alluvium are due to evapotranspiration. Progressive increases in the partial pressure of carbon dioxide and decreases in uncorrected C-14 ages demonstrate atmosphere-ground water interaction. A quantitative mass balance model based on sodium chloride conservation indicates excess calcium, magnesium, and sulfate being derived from local sources. Final concentrations of calcium and magnesium are controlled by calcite and dolomite saturation. Fluorite and silica are depleted due to precipitation of fluorite and silica gel. Calculations show 50 percent of total volume of ground water is discharged by evapotranspiration. (Woodard-USGS)
W79-10165

WATER QUALITY OF SELECTED STREAMS IN THE COAL AREA OF EAST-CENTRAL MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
P. W. McKinley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-298 840, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-142, April 1979. 49 p, 17 fig, 1 tab, 15 ref.

Descriptors: *Water quality, *Montana, *Streams, *Baseline studies, *Coal mines, Streamflow, Water analysis, Anions, Cations, Dissolved solids, Specific conductivity, Trace elements, Nutrients, *Potential coal-mining area, *East-central Montana, Big Dry Creek, Little Dry Creek, Timber Creek, Nelson Creek, Prairie Elk Creek, Sand Creek, Redwater River, Burns Creek.

In October 1975 the U.S. Geological Survey established a network of nine data-collection stations on eight streams in Montana to monitor water quality in potential coal-mining areas. The report summarizes and evaluates the water-quality data that have been collected during the first 2 years (3 years for 1 station) of network operation. Big Dry Creek, Little Dry Creek, Timber Creek, and Nelson Creek are the principal streams forming the Big Dry Creek basin, which is tributary to the Missouri River. These streams all contain water of the sodium sulfate type. Concentrations were high for dissolved solids (433-4,570 mg/L) and generally low for nutrients and trace elements. Prairie Elk Creek, Sand Creek, and the Redwater River flow directly into the Missouri River. Prairie Elk and Sand Creeks have mainly sodium bicarbonate water, whereas the Redwater River is predominately sodium sulfate water. All three streams contained water of high dissolved-solids concentration (160-3,370 mg/L) and generally low nutrient and trace-element concentrations. Burns Creek is tributary to the Yellowstone River. The water type is generally sodium sulfate during the spring and summer and sodium bicarbonate during the fall and winter. Water from Burns Creek ranged from 382 to 1,420 mg/L dissolved solids. (Woodard-USGS) W79-10168

VARIATION OF RAIN CHEMISTRY DURING STORMS AT TWO SITES IN NORTHERN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
V. C. Kennedy, G. W. Zellweger, and R. J. Avanzino.
Water Resources Research, Vol. 15, No. 3, p 687-702, June 1979. 13 fig, 4 tab, 37 ref.

Descriptors: *Chemistry of precipitation, *Rain water, *Chemical analysis, *Precipitation(Atmospheric), *California, Coasts, Data collections, Sites, Chlorides, Sodium, Calcium, Magnesium, Lead, Zinc, Manganese, Copper, Nitrogen, Bromine, Hydrogen ion concentration, *Rain chemistry, *Menlo Park(CA), *Petrolia(CA).

The chemical composition of rainfall at Menlo Park, on San Francisco Bay, is compared with rainfall at Petrolia, which is near the coast about 500 km north of San Francisco. Sequential samples representing 1.35 to 5.4 mm of rain were collected from November 1971 to January 1972. At rural Petrolia the Cl:Na ratio was that of sea water for Cl concentrations ranging from 0.02 to 38 mg/L. In metropolitan Menlo Park, the Cl:Na ratio in rain closely approximated that in sea water above about 0.5 mg/L Cl, but at lower Cl concentrations the ratio exceeded that in sea water, a fact attributed to the presence of anthropogenic Cl. Other constituents dissolved in Menlo Park rain (along with their concentration ranges in milligrams per liter), and believed derived at least in part from anthropogenic sources, were Ca (0.01-1.07), Mg (<0.01-1.08), Pb (0.003-.035), Zn (0.002-.013), Mn (0.0001-.0057), Cu (0.0008-.0024), NO3N (0.02-.54) and Br (<0.01-.12). The range of pH values was smaller in the rural than in the metropolitan areas; average H activity corresponded to a pH of 5.1 to 5.2 in both areas. At petrolia, pH decreased with increased dissolved salts in rainfall, but no relation between pH and dissolved salts was evident at Menlo Park. (Woodard-USGS)
W79-10178

2L. Estuaries

AN OVERVIEW OF THE RHODE RIVER WATERSHED PROGRAM,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10091

BARRIER ISLAND CONFIGURATION,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. Hayden, and C. Jones.
Science, Vol. 204, No. 4391, p 401-403, 27 April 1979. 3 fig, 6 ref.

Descriptors: *Barrier islands, *Virginia, *Geomorphology, *Model studies, On-site investigations, Coasts, Shoals, Movement, Analytical techniques, *Cedar Island(VA), *Wallops Island(VA), *Cape Charles, *Assateague Island.

The 11 Virginia barrier islands are behaving as a chain and are undergoing rapid changes in shoreline configuration. If this trend continues for another 100 years, two capelike features will develop. The process responsible for this island-chain pattern may be a standing edge wave trapped between Assateague Island and Cape Charles. (Humphreys-ISWS)
W79-10244

INERTIAL WAVES IN THE GULF OF ST LAWRENCE: A STUDY OF GEOSTROPHIC ADJUSTMENT,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
C. L. Tang.
Atmosphere-Ocean, Vol. 17, No. 2, p 135-156, 1979. 13 fig, 2 tab, 20 ref, 1 append.

Descriptors: *Internal waves, *Model studies, *On-site investigations, *Gulfs, *Canada, Mathematical models, Analysis, Analytical techniques, Theoretical analysis, Hydrodynamics, Waves(Water), Foreign research, Variability, Frequency, Fluctuations, *Gulf of St Lawrence, *Nova Scotia, Inertial waves, Two layer model.

It was shown that inertial oscillations of significant magnitude can be generated by geostrophic adjustment in a shallow sea. Evidence of them in current-meter data from the Gulf of St Lawrence was presented. The geostrophically unbalanced state required for the adjustment process is identified in the data by the occurrence of high accelerations of the currents. The difference between the inertial oscillations generated by different mechanisms and the intermittence and the frequency shift of the inertial waves were discussed. (Humphreys-ISWS)
W79-10245

HURRICANE SURGE POTENTIALS OVER SOUTHEAST LOUISIANA AS REVEALED BY A STORM-SURGE FORECAST MODEL: A PRELIMINARY STUDY,
National Weather Service, New Orleans, LA.
K. C. Crawford.
Bulletin of the American Meteorological Society, Vol. 60, No. 5, p 422-429, May 1979. 6 fig, 5 ref.

Descriptors: *Hurricanes, *Storm surge, *Louisiana, *Gulf of Mexico, *Model studies, Mathematical models, Winds, Waves(Water), Ocean waves, Coasts, Shores, Lakes, Bays, Water levels, Floods, Storms, Levees, Forecasting, Meteorology, *Lake Pontchartrain(LA), *New Orleans(LA).

A storm-surge model (SLOSH) developed in 1977 for Southeast Louisiana predicts sea, lake, and overland surges from hurricanes. Primary model output is the average of water level conditions over a finite geographical area. The model appears capable of providing definitive evidence for the varied impact of storm surges to future generations in Southeast Louisiana; however, model surge forecasts are governed strongly by the accuracy in describing the movement and intensity of tropical storms. A simplified initial study was undertaken to gain a physical understanding of, and insights on, the potential surges over Southeast Louisiana. A brief synopsis of the hurricane flood potential was given. (Sims-ISWS)
W79-10254

CARBON ISOTOPE RATIOS OF PARTICULATE ORGANIC MATTER IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
F. C. Tan, and P. M. Strain.
Journal of the Fisheries Research Board of Canada, Vol. 36, No. 6, p 678-682, June 1979. 3 fig, 3 tab, 20 ref.

Descriptors: *Organic matter, *Carbon radioisotopes, *Water quality, *Estuaries, Gulfs, On-site investigations, Plankton, Sampling, Testing procedures, Analytical techniques, Surveys, Data collections, Foreign research, *Gulf of St Lawrence.

Sixteen offshore surface samples within the Gulf of St. Lawrence showed low delta 13C values and were similar to 8 offshore surface samples collected seaward of the Gulf of St. Lawrence. The delta 13C surface values were consistent with delta 13C values in plankton produced at the temperature found in the euphotic zone in the study area. Higher values were observed in 4 surface samples from the mouth of the St. Lawrence Estuary and probably result from high carbon demand during periods of high biological productivity. Lower values found in 7 deep particulate organic matter (POC) samples indicate changes in the nature of the POC caused by biological degradation of the organic matter. Significant differences (2-6 parts per thousand) between the uniformly high delta 13C values of the organic carbon in surface sediments and the low values of near-bottom water POC have been observed. The similarity between the delta 13C values of surface water POC and the surface sediments suggests that surface water POC is an important source of organic carbon in surface sediments. Several observations of large vertical delta 13C gradients in deep water POC suggest the presence of resuspended sediments 30-60 m above the sediment-water interface. (Humphreys-ISWS)
W79-10258

PHYTOPLANKTON ECOLOGY OF THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
Fisheries and Marine Service, Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W79-10261

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DOUBLE EFFECT FLOATING SOLAR STILL COMPRISING A SUBMERGED CONDENSING SYSTEM,
J. Eidelberg.
U.S. Patent No. 4,151,046, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1378, April 24, 1979.

Descriptors: *Patents, *Desalination, *Water purification, Desalination apparatus, Solar stills, Solar distillation, Potable water, Condensation.

The double effect floating solar still for recovery of potable water from brackish or sea water, uses a partly immersed corrugated metal plate to heat the upper layer of a body of water in order to establish a temperature difference between the upper and lower sections of the still. The difference in temperature creates a difference in vapor pressures.

forcing the vapor produced in the hot section of the still to flow into a submerged condenser, giving up the heat of condensation to the surrounding water, preheating it before it reaches the stage of evaporation. (Sinha-OEIS)
W79-10259

3F. Conservation In Agriculture

METHOD OF TREATING WATER FOR HORTICULTURAL USES,
Fisons Ltd., London (England).
P. S. Atkins, and F. N. Wilson.
U.S. Patent No. 4,149,570, 8 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 1018, April 17, 1979.

Descriptors: *Patents, *Water treatment, *Monitoring, Nutrients, Plant growth, Plant growth regulators, Agricultural chemicals, Equipment, Nutrient film techniques(NFT).

A system is provided for growing plants using a nutrient film technique characterized in that a nutrient solution is circulated, the volume of circulating solution is monitored and is maintained at the desired level by the addition of water, plant nutrients being fed to the circulating solution in proportion to the water fed to the solution. The invention also provides a trough in which plants are adapted to grow and through which plant nutrient solution is adapted to circulate. The technique minimizes the build up of one chemical without a corresponding build-up of other chemicals, notably nutrient chemicals. (Sinha-OEIS)
W79-10322

EXTRACTORS,
G. J. Wieck.
U.S. Patent No. 4,149,676, 10 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 926, April 17, 1979.

Descriptors: *Patents, *Irrigation, *Irrigation practices, Irrigation efficiency, Equipment, Valves, Water extraction system.

An improved irrigation extraction system is described. An elongated extraction tube resting on sealing saddles on valved risers of a buried mainline is pulled along the mainline by a hydraulically driven capstan on the extraction tube pulling an anchored cable resting on saddles and guiding the tube into each saddle. The extraction tube spans two risers, and has a series of check valves receiving water from the saddles, and opens the valve of each riser as the tube comes into sealed engagement with the saddle of that riser and closes that valve just before the tube is moved out of that saddle. In an alternate embodiment, an extraction tube is moved along floating saddles by powered rollers engaging flanges on risers supporting the saddles, and levers on the risers are pivoted by the tube to actuate capstans to open spring closed valves in the risers. (Sinha-OEIS)
W79-10327

NONLINEAR SENSOR FOR CENTER PIVOT DRIVE CONTROL SYSTEM,
Toro Co., San Marcos, CA. (Assignee).
R. E. Hunter.
U.S. Patent No. 4,149,570, 7 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 890, April 17, 1979.

Descriptors: *Patents, *Irrigation systems, *Irrigation practices, Irrigation efficiency, Application equipment, Center pivot irrigation system, Sensors.

An improvement in angularity sensors employed in center pivot irrigation systems is described. A center pivot irrigation system has self-propelled articulating span units mounting interconnected sections of water carrying conduit. Each span unit has motor means and motor control means for regulating the operation of the associated motor means to maintain the span units in a pre-determined relative alignment in a vertical plane revolving about a vertical line at the center pivot of the system. The control has angularity sensor means which is connected between span units for sensing in a substantially horizontal plane changes in angularity between the span units relative to the desired revolving vertical plane. The angularity sensor incorporates a flexible control rod connected to an actuator rod of the motor control allowing linear actuation of the motor control over a first portion of travel of the control rod and being rotatably stopped at the free end to cause flexure of the control rod and thereby, non-linear actuation of the motor control over a second portion of the movement of the control rod. (Sinha-OEIS)
W79-10328

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ADVANCED METHODOLOGY FOR STORM SEWER DESIGN--PHASE II,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
H. G. Wenzel, Jr., B. C. Yen, and W. H. Tang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 823, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois, Research Report No. 140, June 1979. 86 p, 18 fig, 17 tab. OWRT B-098-ILL(4).

Descriptors: Drainage systems, Optimization, Risks, Sewers, *Storm drains, *Urban drainage, *Urban runoff, Cost analysis, Dynamic programming, Flood damage, Flood routing, Hydraulic design, Hydrograph routing, Mathematical models, Operations research, Probability analysis, Storm runoff, Uncertainties.

This report describes further development of computer models for determining the diameter, slope and elevations of each pipe in a storm drainage system in which the layout and manhole locations are specified. The design procedure is based on a least-cost criterion and utilizes discrete differential dynamic programming as the search technique. In this phase of the study a detention storage capability has been added to the model using two approaches. The first approach requires the specification of a maximum allowable outflow and computes the required storage. The second approach determines the storage volume such that the sum of the storage and pipe system costs is a minimum. The procedure for computation of expected damage costs has been changed to reflect the variation of flood damage with flood volume. Also a surface runoff component has been added. This option uses the hydrograph generation portion of the Illinois Urbana Drainage Area Simulator model. Improved cost specification methods as well as flexible pipe elevation constraint capabilities have been added. The new developments are illustrated using two example basins.
W79-10082

TILE FLOW RESPONSE IN A LAYERED SOIL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
M. F. Walter, R. D. Black, and P. J. Zwerman.
Transactions of the American Society of Agricultural Engineers, Vol. 22, No. 3, p 577-581, May-June 1979. 12 fig, 10 ref.

Descriptors: *Tile drainage, *Flow, *On-site investigations, *New York, Sampling, On-site data collections, Data processing, Evapotranspiration, Rainfall, Precipitation(Atmospheric), Evaporation, Subsurface drains, Tile drains, Pollutants, Path of pollutants, Seasonal, Monthly, Soil water, Soil moisture, Agriculture, Tile flow.

Tile drainage data were collected and analyzed for a 16-yr period on 12 plots in central New York State. Seasonal evapotranspiration had a direct effect on average monthly tile flow. Of the recorded tile flow, 84% occurred in the crop dormant months of November through April. Average annual and monthly precipitation were not found to be good indicators of tile flow. (Sims-ISWS)
W79-10248

DRAINAGE BIBLIOGRAPHY FROM COMPUTER BASED DATA SOURCES,
Science and Education Administration, Orono, ME. North East Plant, Soil and Water Lab.
J. Bornstein, S. Garwood, C. W. Doty, and W. F. Ryan.
Transactions of the American Society of Agricultural Engineers, Vol. 22, No. 3, p 529-531, May-June 1979. 3 fig, 6 ref.

Descriptors: *Data collections, *Drainage, *Bibliographies, Data storage and retrieval, Computers, Information exchange, Information retrieval, Publications, Abstracts, Technical writing, Agriculture, Agricultural engineering, Computer based data sources, Literature searching, Indexes.

The purpose of this paper was to list the data bases with possible references to drainage and to describe a procedure for compiling an individually tailored bibliography to cover any specific aspects of drainage from computer-based data sources or retrieval systems. Data bases were listed that include information on drainage topics. Only acronyms and names were included. (Froehlich-ISWS)
W79-10253

ELIMINATION OF OVERFLOW OF SEWER SYSTEMS,
W. Simon.
U.S. Patent No. 4,150,683, 11 p, 10 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1255, April 24, 1979.

Descriptors: *Patents, *Sewers, *Combined sewers, Storm drains, Flow control, Runoff, Urban runoff.

A technique and an apparatus are provided for eliminating the overflow of combined sewers by adjusting the quantities of water which can flow into the interceptor sewer. This adjustment is achieved in such combined sewers through the regulation of the size of the interconnecting pipe between each catch basin and the lateral line. (Sinha-OEIS)
W79-10282

4B. Groundwater Management

INSTITUTIONAL ARRANGEMENTS FOR INTRASTATE GROUNDWATER MANAGEMENT: A COMPARATIVE ASSESSMENT USING VIRGINIA AS A CASE STUDY,
JBF Scientific Corp., Arlington, VA.
R. F. Ehrhardt, and S. Lemont.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 889, Price codes: A06 in paper copy, A01 in microfiche. Report prepared for Office of Water Research and Technology, April 1, 1979. 100 p, 3 fig, 2 append. OWRT C-80032-P(8410)(1). 14-34-0001-8410.

Descriptors: *Institutions, *Institutional constraints, *Groundwater, *Political aspects, Water rights, Legal aspects, Administration agencies, Virginia, Economic feasibility, *Public administration, *Policy options, Innovative approaches, Economic incentives, Regulatory strategies.

Incidents of contamination of groundwater supplies are becoming more frequent at the same time as demands on the resource for industrial, commercial and residential use are growing rapidly. Surveys of past and present practices in intrastate groundwater management suggest that adequate institutional arrangements do not exist for effective management of the quantity and quality of the groundwater resource. In this report, alternative institutions from public administration theory and practice were examined for their applicability in helping safeguard supplied. In addition, political legal, social, and economic conditions in the Com-

monwealth of Virginia were used in developing a reference case to see which of the theoretically preferred institutional arrangements would be most feasible in real-world circumstances. It is concluded that groundwater management efforts in the example case are best focused at the local level of government, making use of existing governmental units, coordinated on a regional basis by the state, and employing a flexible management program composed of economic incentives as well as regulatory strategies. The preferred institutional arrangement also includes an 'active' emergency response capability by which it conducts rehabilitation procedures for contaminated groundwater sources where necessary, and assesses the responsible party for the cost of remedial action. The report recommends that groundwater managers continue to move ahead with innovative approaches to the resolution of groundwater problems and emphasizes the inherent technical and political uncertainties in natural resources management.
W79-10235

4C. Effects On Water Of Man's Non-Water Activities

LAKE JACKSON WATERSHED STUDY: DESCRIPTION OF SITES, METHODOLOGY AND SCOPE OF RESEARCH,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10087

4D. Watershed Protection

FILTRATION OF SEDIMENT BY SIMULATED VEGETATION I. STEADY-STATE FLOW WITH HOMOGENEOUS SEDIMENT,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
B. J. Barfield, E. W. Tollner, and J. C. Hayes.
Transactions of the American Society of Agricultural Engineers, Vol. 22, No. 3, p 540-545, 548, May-June 1979. 7 fig, 3 tab, 16 ref.

Descriptors: *Filtration, *Sediments, *Grassed waterways, *Model studies, Mathematical models, Filters, Sediment transport, Suspended solids, Grasses, Vegetation, Vegetation effects, Deposition(Sediments), Sedimentation, Steady flow, Sedimentology, Water quality control.

The control of sediment production from disturbed areas is a significant problem to engineers and others concerned with pollution control. The most common method used for controlling sediment production from construction sites is that of sediment retention structures. One alternative sediment control method, recommended by the EPA is the use of vegetal filters. In addition, the Soil Conservation Service accepts the use of grass strips to reduce peak runoff in areas where it is feasible. Peak flow is reduced by the combined effects of increased infiltration and delayed runoff. One severe limitation on the design of vegetal filters is the lack of information on the sedimentation process in filter media. The development of design recommendations for using grass strips as a standard practice for sediment control would be possible if a model were available to predict the movement and deposition of sediment in a filter media. In this report, a model was presented for making these predictions for steadystate flow conditions. The model was based on studies of hydraulics of flow, sediment transport, and deposition profiles conducted in an artificial rigid media. The final result was a model that has a good potential for adaptation to field conditions with actual grasses, non-homogeneous sediment, and unsteady-state flow rates. (Sims-ISWS)
W79-10252

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

STUDIES ON VIRUSES IN WATER,
Utah Water Research Lab., Logan.
R. S. Spendlove, B. B. Barnett, D. B. George, D. J. Adams, and S. F. Hayes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 880, Price codes: A03 in paper copy, A01 in microfiche. Water Quality Series, UWRL/Q-79/02, July 1979. 35 p. OWRT A-040-UTAH(1), 14-34-0001-8047.

Descriptors: *Viruses, Antigens, Monitoring, Bacteriophages, Filtration, Water treatment.

A new procedure for the detection of viral antigens in fecal material was developed. The test is performed by first diluting a fecal sample with phosphate buffered saline to give a liquid consistency. The pH is then adjusted to 8.5-9.0 and the solids are allowed to settle for five minutes. Supernatant fluid from above the fecal sediment is placed on the upper surface of a well of an inverted Immulon microtiter plate and incubated for one hour at 37 degrees C to allow virus to adsorb to the plastic. The Immulon plate is then washed three times with a Tween 20 solution and dried. Adsorbed virus is stained with fluorescein labeled antiviral antibody containing Evan's Blue dye. The stained preparations are examined by epi-fluorescence microscopy for the presence of viral aggregates and virus-containing cellular membranes. The test is applied in a continuous water monitoring procedure that can be used to supplement methods in which infectious viruses are isolated from water. Granular media filtration systems (i.e., sand, anthracite coal and sand; anthracite coal; sand and garnet) are ineffectual in the removal of the bacteriophage MS 2 from water when used as in-line direct filters. Batch assays have indicated a 93 percent reduction of MS 2 can occur when polyelectrolytes are added to the water. In addition, alum concentrations of 20, 30, 40, and 50 mg/l remove 80 to 98 percent of the virus by precipitation. No reduction of MS 2 was observed at alum concentrations from 1 to 10 mg/l.
W79-10083

LAKE JACKSON WATERSHED STUDY: DESCRIPTION OF SITES, METHODOLOGY AND SCOPE OF RESEARCH,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10087

AN OVERVIEW OF THE CHOWAN RIVER RURAL RUNOFF STUDY,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik, W. S. Galler, J. W. Gilliam, D. W. Hayne, and D. H. Howells.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 51-66, 1977.

Descriptors: *Runoff, *Watersheds(Basins), *Pollutants, *Sampling, *Virginia, *North Carolina, Water pollution, Water pollution sources, Path of pollutants, Instrumentation, Laboratory tests, Pollutant identification, Plankton, Nutrients. Algae, Rural areas, Agriculture, Agricultural watersheds, *Chowan River Basin(VA-NC).

The rationale and working basis for this three-year study in the Chowan River Basin of Virginia and North Carolina were reviewed. The major thrust of the co-investigative group was to determine the feasibility of statistical scientific sampling for the evaluation of rural runoff and also for the identification and interpretation of nonpoint sources. Data for making feasibility judgments are being obtained on two small conveniently located subareas of the Chowan River Basin because they were judged to represent the four types of land that together constitute most of the basin; thus this arbitrary (as opposed to random) selection of parts of the basin would provide information on four land types or four physiographic regions: (1) poorly-drained Coastal Plain, (2) well-drained Coastal Plain, (3) agricultural Piedmont, and (4) silvicultural Piedmont. Field sampling to obtain flow and quality data are procured by grab sampling and flow meter methodologies at all sites and by stage recorders and automated samplers activated by stage differences at five sites which are also grab sampled. (See also W79-10084) (Sims-ISWS)
W79-10088

WATERSHED RESEARCH IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
J. G. Ogden, III.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 67-82, 1977. 2 fig, 4 tab, 5 ref.

Descriptors: *Watersheds(Basins), *Runoff, *Streamflow, *Hydrogen ion concentration, *Pollutants, Air pollution, Water pollution, Water pollution sources, Drainage, Chemicals, Cations, Heavy metals, Pollutant identification, Precipitation(Atmospheric), Rainfall, Hydrographs, Forests, Forest watersheds, *Nova Scotia.

In addition to several federal and provincial agencies which maintain numerous water quantity and water quality sampling stations throughout the province, 6 small watersheds are instrumented for input/output investigations. Three watersheds are designated as I.H.D. hydrologic stations and are limited to precipitation, stream, and groundwater runoff with occasional water chemistry measurements related to groundwater composition. In 1977, 3 watersheds were instrumented with multiple bulk precipitation samplers, as well as specific event samplers. Watershed outlet water chemistry measurements were quantitatively sampled for major ions to determine input/output for each watershed. Major concern was for effects of precipitation which in recent years has decreased to average pH values of 3.5 to 4.7 with conductivities in the range of 20 to 80 micromhos/cm on nutrient loss from Nova Scotia ecosystems. Seasonal event sampling for heavy metals as well as major ions were selected on the basis of storm origin, designated as Atlantic, Eastern Seaboard, and Great Lakes. (See also W79-10084) (Sims-ISWS)
W79-10089

THE MAHANTANGO CREEK WATERSHED--AN INTERDISCIPLINARY WATERSHED RESEARCH PROGRAM IN PENNSYLVANIA,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W79-10090

AN OVERVIEW OF THE RHODE RIVER WATERSHED PROGRAM,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10091

WALKER BRANCH WATERSHED ELEMENT CYCLING STUDIES: COLLECTION AND ANALYSIS OF WETFALL FOR TRACE ELEMENTS AND SULFATE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2K.
W79-10092

PRECIPITATION AND NUTRIENT EXPORT FROM A SMALL COASTAL ECOSYSTEM IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of

Biology.
For primary bibliographic entry see Field 2K.
W79-10093

NUTRIENT LOADING OF THE RHODE RIVER WATERSHED VIA LAND USE PRACTICE AND PRECIPITATION,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10094

NUTRIENT DISCHARGE FROM WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-10100

NUTRIENT EXPORT FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W79-10101

NUTRIENT YIELD ASSESSMENT BY DIFFERENT SAMPLING STRATEGIES,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W79-10102

THE MAHANTANGO CREEK WATERSHED--SOURCE AND REACTION OF PHOSPHATE DURING STORM HYDROGRAPHS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5B.
W79-10104

NUTRIENT DISCHARGE FROM RHODE RIVER WATERSHEDS AND THEIR RELATIONSHIP TO LAND USE PATTERNS,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10105

DYNAMICS OF TRACE ELEMENT EXPORT FROM A DECIDUOUS WATERSHED, WALKER BRANCH, TENNESSEE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-10116

LAND UTILIZATION AND METALS DISCHARGE FROM THE RHODE RIVER WATERSHED,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10117

RUNOFF STUDIES OF THE AGRICULTURAL HERBICIDES ALACHLOR AND ATRAZINE FROM THE RHODE RIVER WATERSHED DURING THE 1976 GROWING SEASON,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10118

SAMPLING METHODOLOGIES FOR ASSESSING RURAL RUNOFF,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W79-10121

PROBABILITY SAMPLING OF SMALL STREAMS: PROBLEMS AND RESULTS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
For primary bibliographic entry see Field 7B.
W79-10122

PHYSIOLOGICAL DYSFUNCTION OF THE HAEMOPOIETIC SYSTEM IN A FRESH WATER TELEOST, LABEO ROHITA, FOLLOWING CHRONIC CHLORDANE EXPOSURE. PART II-ALTERATIONS IN CERTAIN ORGANIC COMPONENTS AND SERUM ELECTROLYTES,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. K. Bansal, S. R. Verma, A. K. Gupta, and R. C. Dalela.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 674-680, 1979. 1 tab, 23 ref.

Descriptors: *Pesticide toxicity, *Fish physiology, *Electrolytes, Chemical analysis, Animal metabolism, Carbohydrates, Lipids, Chlorinated hydrocarbon pesticides, Mortality, Magnesium, Chlorides, Phosphorus, Iron, Sodium, Calcium, *Hematology, *Tissue analysis, *Chlordane.

The present study was undertaken to evaluate the effects of chlordane on the blood chemistry of a fresh water teleost, L. rohita after 60 days treatment at concentrations of 17, 23, 35 and 70 microgr/L. The elevated blood sugar level (hyperglycaemia) indicates a disrupted carbohydrate metabolism, which may be mainly due to the enhanced breakdown of liver glycogen (glycogenolysis), mediated perhaps by adrenocortical hormones and reduced insulin secretory activity. The observed elevation of blood glucose increased with increased exposure concentration. Cholesterol, phospholipids and triglycerides showed significant decreases while free fatty acids were increased. The major serum electrolytes Na and Cl were highly correlated and significantly increased. In addition, serum Ca and Mg were also significantly elevated. Increased mortality at higher chlordane concentrations may be due to disruption of osmoregulatory mechanisms. (See also W79-10186) (Deal-EIS)
W79-10187

EFFECTS OF TEMPERATURE ON DOMINANT MACROZOOBENTHOS SPECIES OF THE RIVER SAVA UNDER LABORATORY CONDITIONS,
Zagreb Univ. (Yugoslavia). Faculty of Natural Sciences and Mathematics.
M. Mestrov, N. Krkac, M. Kerovec, A. Lui, and R. Lattinger-Penko.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1910-1914, 1978. 1 tab, 10 ref.

Descriptors: Bioassay, Laboratory test, Benthos, Freshwater, Invertebrates, *Fresh water macrobenthos, *Mortality, *Water temperature, *Thermal shock, *Acclimation, Acclimation temperature, Molluscs, Oligochaetes, Amphipoda, Aquatic insects, Water pollution effects, Methodology.

Experiments show that a sudden rise in water temperature from 5 to 15 degrees C have no harmful effects on most common invertebrate benthos. Physa, however, has a serious mortality rate and Chironomus was provoked to a premature metamorphosis. All invertebrates acclimatized to 10, 15 and 20 degrees C can withstand thermal shocks up to the maximum tolerance limits with no serious consequences. The majority of species tolerate temperature up to 28 degrees C, Erpubdella and Physa up to 30 degrees C. (Katz-EIS)
W79-10188

EFFECTS OF ORGANIC WASTE ON PRIMARY AND SECONDARY PRODUCTION IN THE EMS-DOLLARD ESTUARY,
Nederlands Inst. voor Onderzoek der Zee, Texel.
P. DeWolf.
Hydrobiological Bulletin, Vol. 12, No. 3/4, p 260-272, 1978. 6 fig, 3 tab, 26 ref.

Descriptors: *Organic wastes, *Toxicity, *Primary productivity, *Secondary productivity, Industrial wastes, Estuaries, Sewage effluents, Turbidity, Biochemical oxygen demand, Phytoplankton, Benthic fauna, Biomass, Growth rates, Ems-Dollard Estuary, Netherlands, Domestic wastes.

The Ems-Dollard estuary receives large amounts of organic waste from the hinterland and there is imported organic material from the North Sea. Taken together the amount of allochthonous organic material is about 800 g C/m2/year in the Dollard. This import results in a very high turbidity, a low primary production of phytoplankton as well as phytobenthos, and a low standing stock of macrobenthos. The role of imported organic material as a source of food for this fauna is discussed. (Deal-EIS)
W79-10192

MERCURY IN THE AQUATIC ECOSYSTEMS OF THE PROVINCE OF QUEBEC, CANADA (IN FRENCH),
Environmental Protection Service, Montreal (Quebec).
C. E. Delisle.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1947-1955, 1978. 1 fig, 3 tab, 18 ref. (English Summary).

Descriptors: *Mercury, *Freshwater fish, Estuaries, Quebec, *Canada, *Crustaceans, Clams, Mussels, Crabs, Shrimp, Lobsters, Benthos, Zooplankton, Pike, Muskellunge. White fish, Trout, Bass, Yellow perch, Sturgeon, Marine fish, Surface water, Rain water, Snow.

The purpose of this paper is to give a general overview of the present knowledge regarding mercury in the aquatic ecosystems of Quebec. Different investigators have collected biological and physical materials for Hg analysis. Their results are summarized. The mercury content of various freshwater and marine fish and invertebrates average between 0.19 ppm in white fish and 3.0 ppm in crabs, shrimp and lobsters. Of the freshwater fish species, pike and muskellunge average 0.92 ppm. (Katz-EIS)
W79-10194

HEAVY METAL CONCENTRATIONS AND PHYTOPLANKTON PRODUCTION, BIOMASS AND STRUCTURE IN A NORTHERN ESTUARINE AREA OF THE BALTIC SEA,
Salt and Water Ltd., Helsinki (Finland).
K. Pietilainen, and T. Melvasalo.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1963-1969, 1978. 3 fig, 4 tab, 10 ref.

Descriptors: Metals, *Iron, *Zinc, *Manganese, *Lead, *Zooplankton, Chlorophyll, *Primary productivity, Biomass, Baltic Sea, Finland, Eutrophication, Industrial wastes, Domestic wastes, Cyanophyta, Water quality, Chemical analysis, Particulate matter, Nutrients, Steel industry.

Effluents from metal and steelworks are discharged into a northern estuarine area of the Baltic Sea. Studies indicated a strong positive correlation between chlorophyll a and iron, manganese, and zinc. Phytoplankton biomass correlated positively with iron and zinc. The biomass of Cyanophyta correlated best with manganese. The maximum primary productivity coincided with the maximum of iron and manganese, whereas none of the biological parameters correlated with lead. (Katz-EIS)
W79-10197

RATIO ATP/CHLOROPHYLL AS AN INDEX OF RIVERS' WATER QUALITY,
Istituto di Ricerca Sulle Acque, Rome (Italy).
G. Chiaudani, and R. Pagnotta.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1897-1901, 1978. 2 fig, 2 tab, 11 ref.

Descriptors: Water pollution effects, *Monitoring, *Enzymes, Chlorophyll, *Phytoplankton, Water quality, *Chemical analysis, Eutrophy, Domestic

wastes, River Tiber, Italy, ATPase, Chlorophyll, Dissolved oxygen, Chemical oxygen demand, Ammonium compounds.

Investigations on the Tiber River, Italy indicate that the crude ATP/chlorophyll ratio is significantly correlated with chemical parameters. This ratio is suggested as a valuable and rapid tool for detecting changes in water quality in rivers which are eutrophic or receive domestic wastes. The ATP/chlorophyll ratio is regarded as a good way to calculate the autotrophic index. Further research on a greater variety of rivers is needed. (Katz-EIS)
W79-10198

EFFECTS OF EXPERIMENTAL OIL SPILLS ON CHIRONOMIDAE IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
S. C. Mozley.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1941-1945, 1978. 4 fig, 1 tab, 4 ref.

Descriptors: Oil, *Oil spills, *Water pollution effects, On-site-investigation, Methodology, Aquatic insects, *Chironomids, Water birds, Alaska, Point Barrow, *Benthos, Stoneflies, Toxicity, Mortality, Prudhoe Bay crude oil, Reproduction.

A study was made of the effects of Prudhoe Bay crude oil spilled on four tundra ponds near Point Barrow, Alaska. Initially oil killed macroinvertebrates only in peripheral areas when they could contact it on plants and at the surface. In one treated pond one species Trichotonypus was virtually eliminated but in another pond an unusually large population became reestablished. The residual slick interfered with mating and oviposition of chiromonids among the plants. Major oil spills could eliminate a major food resource for breeding birds. (Katz-EIS)
W79-10199

INTRODUCTION OF WASTE HEAT AND EFFECTS ON MICROORGANISMS,
Bundesanstalt fuer Gewasserkunde, Coblenz (Germany, F.R.).
M. Wunderlich.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1855-1860, 1978. 2 fig, 4 tab, 5 ref.

Descriptors: *Water temperature, Water pollution effects, *Thermal pollution, Thermal stress, Industrial wastes, Rivers, *Thermal power plants, River Rhine, Microorganisms, Cooling water, *Aquatic bacteria, *Aquatic fungi, Bioassay, Laboratory tests, Respiration, Oxygen consumption, Aquatic fungi, Phytoplankton, Enzymes.

The results show that, besides the warming-up range, the absolute temperature reached exerts a significant influence on aquatic microorganisms. Warming-up to 30C produces effects on the growth of phytoplankton, fungi and psychorophilic bacteria. From 40C upward, mesophilic bacteria are damaged and a thermic activation of bacterial dormancy stages is initiated. Conclusions were based on laboratory studies and as a result of two field observations of the River Rhine from Karlsruhe to the Dutch border. Laboratory studies observed the change in oxygen consumption of bacteria, the changes in the dehydrogenase activity of saprophytic water bacteria. (Katz-EIS)
W79-10200

INFLUENCE OF BEDLOAD TRANSPORT ON THE MACROBENTHOS OF RUNNING WATERS,
Bonn Univ. (Germany, F.R.). Inst. fuer Landwirtschaftliche Zoologie und Bienenkunde.
M. Petran, and P. Kothe.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1867-1872, 1978. 6 fig, 8 ref.

Descriptors: *Benthos, *Aquatic insects, *Oligochaetes, Tubificids, Sediments, Particle size, Substrate, Currents(Water), Biological indicator, *Bedload transport, Grain size, Danube River, Rhine River, Macrobenthos, Environmental effects, Upper Rhine River, Running waters.

Field investigations as well as experiments demonstrated bedload transport acting as an important ecological factor on benthonic organisms. In the running waters of the Danube and Upper Rhine, which were investigated only some species of Naididae and Tubificidae were able to colonize benthic areas with shifting substrate. In the substrate layer underneath the shifting gravel having a high rate of water exchange these organisms find optimal living conditions. Here they can even occur in higher abundances than in stable substrate. All of the other species were not able to colonize areas of shifting substrate. The composition of benthos can be used as a biological indicator for the stability of the substrate. This biological indication is applicable for the estimation of the location and the width of bedload transport in a river. (Katz-EIS)
W79-10201

RELATIVE TOLERANCE OF SOME SALMONIDS TO ACID WATERS,
Norsk Inst. for Vannforskning, Blindern.
M. Grande, I. P. Muniz, and S. Andersen.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 2076-2084, 1978. 6 fig, 4 tab, 20 ref.

Descriptors: Freshwater fish, Brown trout, *Brook trout, Rainbow trout, Atlantic salmon, Lakes, On-site-investigation, Hydrogen ion concentration, *Acidic water, *Acidity, Bioassay, *Mortality, Water pollution effects, Water pollution sources, Norway, *Acid snowmelt, Water, Lake Langtjern.

Experiments have been performed to study the tolerance of different species of salmonids to acid waters (pH 4.4-5.5). Brown trout (Salmo trutta L.), brook trout (Salvelinus fontinalis Mitchill), rainbow trout (Salmo gairdnerri Richardson), Atlantic salmon (Salmo salar L.) and hybrids between char species were stocked in small and medium-sized acid lakes and tested in tanks to compare their relative survivals. These species can be ranked in the order brook trout, brown trout, Atlantic salmon and rainbow trout, with brook trout as the most tolerant to low pH. Factors other than pH, such as genetic variability, age of fish, physical conditions and water quality may influence this ranking. (Katz-EIS)
W79-10202

MUDDY OFF-FLAVOUR IN BREAM (ABRAMIS BRAMA L.) FROM THE PORVOO AREA, GULF OF FINLAND,
Helsinki Univ. (Finland). Dept. of Limnology.
P.-E. Persson.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 2098-2102, 1978. 2 tab, 33 ref.

Descriptors: *Eutrophy, *Municipal sewage, Freshwater fish, Estuaries, Finland, Baltic Sea, Porvoo, Algae, Phytoplankton, Blue-green algae, Oscillatoria agardhii, Odor, *Odor-producing algae, Geosmin, Actinomycetes, Bream, Abramis Brama, Gulf of Finland.

This investigation was regarding the muddy off-flavour in bream (Abramis brama) from a dilute brackish water bay near Porvoo, on the south coast of Finland. The bay is extremely eutrophic due to municipal sewage. Muddy off-flavours in bream developed when the biomass of the blue-green alga Oscillatoria agardhii reached its peak (21.8 mg/l, corresponding to 69.3% of total phytoplankton biomass). Since some strains of O. agardhii produce geosmin, it could be the cause of the off-flavours in the study area, also. Earthy-smelling actinomycetes were present in the water throughout the investigation, and may have contributed to the off-flavours. (Katz-EIS)
W79-10203

A HYPOTHESIS TO EXPLAIN THE DISTRIBUTION OF NATIVE TROUT IN A DRAINAGE OF MONTANA'S BIG HOLE RIVER,
Claremont Graduate School, CA. Dept. of Joint Science.
C. R. Feldmeth, and C. H. Eriksen.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 2040-2044, 1978. 2 fig, 1 tab.

Descriptors: Freshwater fish, Montana, *Big Hole River, Cutthroat trout, Grayling, Odell Lake, *Water temperature, Oxygen, *Oxygen minima, Fish physiology, Bioassay, Methodology, Environmental effects, *Fish behavior, Fish migration, Fish population.

A study was made in Odell Lake, Montana, to determine the environmental factors affecting the distribution of southern grayling and cutthroat trout in the Big Hole River. In particular, the fishes comparative tolerance to high temperatures and to oxygen minima was observed. Grayling adults lost equilibrium at 26.9 degrees C and adult cutthroat at 27.1 degrees C. The oxygen tolerance of both species were about the same about 2.2 ppm O2 at 17-18 degrees C and 16.6 ppm O2 at 4-5 degrees C. (Katz-EIS)
W79-10204

THE PRESENT STATE OF FISHING IN LESTIJOKI, A SMALL RIVER IN FINLAND,
Oulu Univ. (Finland).
T. Valtonen, and A. Niemi.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 2085-2091, 1978. 3 fig, 2 tab, 10 ref.

Descriptors: Brown trout, Crayfish, Lampreys, *Iron, *Acid water, *Hydrogen ion concentration, Freshwater fish, On site investigation, Lestijoki River, Finland, Bay of Bothnia, Water quality, Suspended solids, *Humic acid, Water pollution, Sources.

The Lestijoki is a small river in Finland which flows into the Bothnian Bay. The water of the river has much humus and is acidic. Domestic wastes are discharged into the river. Iron content has been observed to be 1.71 to 2.08 mg/l and the pH varies between 5.3 and 7.1. There is no evidence that the trout, crayfish or river lamprey are affected by water quality. The trout fishery is badly mismanaged. (Katz-EIS)
W79-10205

EFFECT OF THE GREEN ALGAE SCENEDESMUS OBLIQUUS AND CHLORELLA VULGARIS ON HETEROTROPHIC BACTERIA IN POLLUTED WATERS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Lab.
I. Dor.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1930-1933, 1978. 7 fig, 7 ref.

Descriptors: Algae, *Phytoplankton, *Scenedesmus, *Chlorella, *Bacteria, Heterotrophic bacteria, Water pollution sources, Bioassay, Water pollution effects, Waste disposal, Waste water treatment, Sewage, Bacterial inhibition, Sewage bacteria, Sewage effluents.

The green algae Scenedesmus obliquus and Chlorella vulgaris compete for nutrients with heterotrophic bacteria. Algae which eliminate bacterial competition by the production of inhibiting substances which are effective against a large spectrum of heterotrophic bacteria have success in variously polluted waters. Laboratory tests indicate that an algal culture filtrate can inhibit several strains of sewage bacteria. (Katz-EIS)
W79-10207

USE OF BIOTIC INDICES AS A TOOL FOR WATER QUALITY ANALYSIS IN RIVERS,
Norsk Inst. for Vannforskning, Blindern.
G. F. Jorgensen.
Verhandlungen Internationale Vereinigung fur

Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1772-1778, 1978. 3 fig, 2 tab, 6 ref.

Descriptors: Biota, *Benthos, *Monitoring, *Rivers, Norway, Great Britain, Animal populations, *Animal groupings, Biotic index, Norwegian rivers, Stoneflies, Mayflies, Caddisflies, Amphipoda, Gammarus, Aquatic insects, Oligochaetes, River Nitelva, River Fjellhamarelva, Water quality, Biological monitoring.

Benthic communities which respond tc the combined impact of various environmental factors may be regarded as a potential permanent monitoring system. Biological data combined with a consideration of chemical, hydrological data may provide a basis for water management decisions. Four different biological indices were tested to determine their suitability for Norwegian waters. Indices derived from studies of British rivers fit fairly well the circumstances of the Norwegian rivers. (Katz-EIS)
W79-10208

THE DISSOLVING OF SOME PHOSPHORUS MINERAL COMPOUNDS BY MICRO-ORGANISMS IN THE BOTTOM SEDIMENTS OF FERTILIZED LAKES (IN POLISH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Hydrobiology and Water Conservation.
S. Niewolak, A. Korycka, and K. Krasnicki.
Roczniki Nauk Rolniczych, Series H, Vol. 99, No. 1, p 141-174, 1978. 8 tab, 5 fig, 98 ref.

Descriptors: *Lakes, *Nutrients, Water quality, Fertilization, Fertilizers, *Phosphorous compounds, Bacteria, *Micro-organisms, Poland, Mazurian Lakes, Nitrogen compounds, Ammonium compounds, Aerobic bacteria, On-site-investigation.

The study includes the results of investigations on dissolving by micro-organisms of tricalcium phosphate, ferrous phosphate and super-Thomas slag in the bottom sediments of Lakes Czarna Kuta, Dgal Maly, Piecek and Smolak in the vicinity of Wegorzewo in the Mazurian Lake Region. The lakes were fertilized with commercial fertilizers (lime, ammonium nitrate, super-Thomas slag, potassium salts). The investigations were conducted over the period 1972-1974. Of the bacteria dissolving mineral phosphorus compounds aerobic bacteria occurs mainly, anaerobic being found in smaller numbers. Actinomycetes and fungi were rarely found and in amounts not exceeding several colonies in 1 g of sediment dry matter. Bacteria dissolving tricalcium phosphate, ferrous, phosphate and super-Thomas slag occurred more numerously in the surface layers of the bottom sediments of the Wegorzewo Lakes (0 to 5 cm). Their numbers decline as depth of the lake bottom was increased. The greatest number of bacteria dissolving tricalcium phosphate and super-Thomas slag was found in the bottom sediments of Lake Czarna Kuta (4,430,000 and 4,560,000 cells per g of dry matter respectively) dissolving ferrous phosphate in the sediments of Lake Smolak (up to 10,500,000 cells per 1 g of dry matter). (Katz-EIS)
W79-10209

AMMONIFICATION PROCESSES IN FERTILIZED LAKES,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Hydrobiology and Water Conservation.
S. Niewolak, A. Korycka, and E. Potocka.
Ekologia Polska, Vol. 26, No. 4, p 555-572, 1978. 10 fig, 20 tab, 20 ref.

Descriptors: *Lakes, *Bacteria, *Nitrogen, Microorganism, *Nutrients, Ammonification, Ammonium compounds, Poland, Nitrogen fixing, Nitrogen cycle, Fertilization, Fertilizers, Masurian Lakes, Ammonifying microorganisms, Water temperatures.

Changes in the number of ammonifying bacteria and the ammonification rate in water and bottom sediments of lakes Czarna Kuta, Dgal Maly, Piecek and Smolak of the Masurian Lakeland, fertilized with mineral salts in 1971-1974, were investigated. The ammonifying bacteria are more abundant in the water close to the bottom and in the surface (0-5 cm) layer of bottom sediments of lakes examined. Their numbers increase from spring to summer, attaining the maximum after each fertilization in May, June and July. Simultaneously, the potential ammonification activity at 25 degrees C and at the actual temperature occurring in the lakes increases and sometimes also the NH4-N content in lake water. (Katz-EIS)
W79-10210

THE ADAPTATION OF DIGESTIVE ENZYMES TO TEMPERATURE, SEASON AND DIET IN ROACH, RUTILUS RUTILUS L. AND RUDD SCARDINIUS ERYTHROPHTHALMUS L. 1. AMYLASE,
Innsbruck Univ. (Austria). Inst. fuer Zoophysiologie.
R. Hofer.
Journal of Fish Biology, Vol. 14, p 565-572, 1979. 7 fig, 18 ref.

Descriptors: *Enzymes, *Seasonal, *Fish physiology, Digestion, Water temperature, Fish food organisms, Fish diets, Animal metabolism, Biochemistry, Food habits, *Roach, *Rudd.

Seasonal changes of the amylolytic activity in the gut content of roach and rudd in four Tyrolean lakes and the adaptation of the amylase to four acclimation temperatures and to different natural foods were studied. In roach amylolytic activity varied with the environmental temperature. Between September and October, however, enzyme activity shifted to a higher level where it remained for the entire cold season. In rudd, which has almost the same seasonal pattern of amylolytic activity as the roach, the activity of the enzyme is independent of environmental temperature. This suggests an endogenous rhythm of enzyme activity. (Deal-EIS)
W79-10211

STUDIES ON THE TOXICITY OF A FEW PESTICIDES ON COLISA FASCIATUS AND NOTOPTERUS NOTOPTERUS WITH REFERENCE TO HISTOPATHOLOGY AND HISTOCHEMISTRY. PART 1: BIOASSAY STUDIES,
D.A.V. Coll. Muzaffarnagar (India). Dept. of Zoology.
S. P. Gupta, S. R. Verma, and R. C. Dalela.
Acta hydrochimica et hydrobiologica, Vol. 7, No. 2, p 223-238, 1979. 6 tab, 40 ref.

Descriptors: *Pesticide toxicity, *Aldrin, *Fish behavior, Freshwater fishes, Animal pathology, Bioassay, Mortality, Lethal limit, Water temperature, Dissolved oxygen, Hydrogen ion concentration, *Organophosphorus pesticides, *Chlorinated hydrocarbon pesticides, *Parathion.

An attempt has been made to study the toxicity of two commonly used pesticides aldrin (organochlorine) and ethyl-parathion (organophosphorous) to the fish Colisa fasciatus and Notepterus notopterus. During bioassay studies, the behavior of the fishes was recorded. The aldrin concentration used lies between 0.021 mg/l and 0.042 mg/l for C. fasciatus and 0.00056 mg/l and 0.00135 mg/l for N. notopterus. The ethyl-parathion concentration used lies between 1.8 mg/l and 3.7 mg/l for C. fasciatus and 0.49 mg/l and 1.00 mg/l for N. notopterus. The effect of lethal aqueous concentrations of pesticides on the fishes prior to death are usually manifested by excitation, erratic swimming ability, difficulty in respiration, increasing in ventilation rate, jerky movements of body and fin fast, up- and downward movements, convulsions, loss of equilibrium, loss of the original colour of the body skin and the excess secreation of muens by the gills and the body wall. The TLm values for 24, 48 and 96 hours of exposition are determined for both species of fish and both pesticides at the following variables: three levels of temperature; three levels of dissolved oxygen; three levels of pH; and three fish sizes. The harmless concentration to C. fasciatus ranged from 0.0049 mg/l to 0.0161 for aldrin, 0.54 mg/l to 0.99 mg/l for ethyl-parathion and to N. notopterus from 0.00012 mg/l to 0.00045 mg/l for aldrin, 0.10 mg/l to 0.21 mg/l for ethyl-parathion. (Deal-EIS)
W79-10212

MERCURY CIRCULATION IN AQUATIC BIOCONESES. PART 1: MERCURY (II)-METABOLISM IN PHYTOPLANKTON,
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
B. Havlik, J. Stary, J. Prasilova, K. Kratzer, and J. Hanusova.
Acta hydrochimica et hydrobiologica, Vol. 7, No. 2, p 215-227, 1979. 3 fig, 24 ref.

Descriptors: *Mercury, *Absorption, *Phytoplankton, Chlorella, Scenedesmus, Cyanophyta, Metabolism, Path of pollutants, Chemical reactions, Tracers, Enzymes, *Microcystis, *Bioaccumulation.

The metabolism of inorganic mercury has been studied in stationary cultures of planktonic algae (Chlorella kessleri, Scenedesmus obliquus and Microcystis incerta that were exposed for 14 days to the concentration of 0.0000002 M of Hg. Individual chemical forms of mercury were determined in algae and in the culture medium at regular intervals. All the studied phytoplankton species started to metabolize mercury immediately after its application, with the exception of the blue-green alga Microcystis incerta. The accumulation of mercury proceeds without interruption till the end of the experiment. After a 14 day cultivation about 60 - 80% of added mercury was present in algal cells and the portion of mercury washable from the cell surface did not exceed 2%. It was found that more than 99.5% of mercury in cultivation medium and more than 99.5% of mercury in algae was present in the form of Hg(II). A transformation of inorganic mercury to methyl-, or phenyl-mercury due to the action of algae was not observed. (Deal-EIS)
W79-10213

ALUMINUM SULFATE (ALUM) FOR PRECIPITATING CLAY TURBIDITY FROM FISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquaculture.
C. E. Boyd.
Transactions of the American Fisheries Society, Vol. 108, p 307-313, 1979. 3 fig, 4 tab, 13 ref.

Descriptors: *Turbidity, *Sediments, Particle sizes, Ponds, *Aquiculture, Fish farming, Fish establishment, *Alum, Gypsum, Ferric sulfate, Minnows, Freshwater fish, Fathead minnows, Clays, Hydrogen ion concentration, Alkalinity, Water quality, Water chemistry, Water management(Applied).

Alum was more effective than ferric sulfate, hydrated lime, or gypsum in removing clay turbidity from laboratory suspensions of clay. A simple alum-requirement test was developed to determine the amount of alum needed to floc clay particles in pond water. Alum applied to seven ponds at rates determined by this test removed 84 to 97% of the turbidity within 48 hours. Alum-requirement values ranged from 10 to 30 mg/liter for 23 samples of pond waters containing clay turbidity. Each mg/liter of alum destroyed approximately 0.5 mg/liter of total alkalinity, and depressed pH. Fathead minnows (Pimephales promelas) were unharmed by 10-30 mg/liter alum if the total alkalinity was initially above 20 mg/liter, and were unharmed by floc resulting from alum treatment. In waters with total alkalinity below 20 mg/liter, hydrated lime or agricultural limestone may be applied to prevent severe depression of alkalinity and pH that would otherwise be caused by alum. (Katz-EIS)
W79-10214

DETERMINATION OF TOTAL AMMONIA NITROGEN AND CHEMICAL OXYGEN DEMAND IN FISH CULTURE SYSTEMS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquaculture.
C. E. Boyd.
Transactions of the American Fisheries Society, Vol. 108, p 314-319, 1979. 3 fig, 3 tab, 11 ref.

Descriptors: *Water pollution sources, Methodology, Chemical analysis, Water quality, *Aquiculture, Nitrogen compounds, *Ammonia, Total ammonia, Nitrogen, *Fish hatchery, Monitoring, Chemical oxygen demand, Laboratory tests, Fish establishment, Fish farming, Toxicity.

Total ammonia nitrogen (TAN) was measured by the phenate method on filtered and distilled portions of samples from waters used for intensive fish culture. There was a high correlation between TAN values for filtered and distilled portions of samples. The average percentage recovery of 0.30 mg/liter additional of total ammonia nitrogen to samples was 96.4% for distilled portions and 96.7% for filtered portions. Precision of the two versions of the phenate method did not differ. A simple heat-of-dilution chemical oxygen demand (COD) technique was developed which yielded values highly correlated with standard COD values. The heat-of-dilution technique was as precise as the standard COD method, but did not oxidize organic matter as completely. COD values by the heat-of-dilution method averaged 60.2% of standard COD values. (Katz-EIS)
W79-10215

BEHAVIORAL RESPONSES OF SHINER PERCH TO CHLORINATED PRIMARY SEWAGE EFFLUENT,
Washington Univ., Seattle. Fisheries Research Inst.
P. A. Dinnel, Q. J. Stober, and D. H. Di Julio.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 708-714, 1979. 2 fig, 1 tab, 12 ref.

Descriptors: *Fish behavior, *Sewage effluents, *Shiners, Toxicity, Primary treatment, Chlorination, Waste water treatment, Water pollution effects, Water chemistry, Fish populations.

The impact of chlorinated sewage effluent on fish and many invertebrates is difficult to assess because of the behavioral component involved, that is, is the organism attracted or repelled by the effluent plume. The object of this study was to determine the behavioral responses of a locally common marine fish (Cymatogaster aggregata) to chlorinated primary sewage effluent in seawater. Aquaria tests showed that shiner perch avoided levels of chlorinated sewage which would have been lethal to them in 96h. However, they were attracted to lower effluent concentrations which have been shown to produce sublethal damage. Possible mechanisms for this attraction are discussed. (Deal-EIS)
W79-10221

TAURINE AND GLYCINE IN THE GILLS OF THE CLAM PROTOTHACA STAMINEA EXPOSED TO CHLORINATED SEAWATER,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
G. Roesijadi.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 543-547, 1979. 2 tab, 6 ref.

Descriptors: *Amino acids, *Chlorination, *Clams, Animal physiology, Biochemistry, Chemical analysis, Sea water, Animal metabolism, Toxicity, Water chemistry, *Tissue analysis.

The levels of free amino acids in the tissue of molluscs have been reported to fluctuate as a function of environmental stress. In the present study, individuals of the clam Prototthaca staminea were exposed to chlorinated seawater for 26 days and the free amino acid levels of the gill tissue were measured. The results of the present study demonstrated an alteration in the free glycine content in the gills. Taurine and total free amino acid concentrations and taurine:glycine ratios, however, were not found to be significantly different when 26 da control values were compared to values for exposed clams sampled at the same time. (Deal-EIS)
W79-10222

AN ASSESSMENT OF THE IMPORTANCE OF TEMPERATURE AS A FACTOR CONTROLLING THE GROWTH RATE OF BROWN TROUT IN STREAMS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
R. W. Edwards, J. W. Densem, and P. A. Russell.
Journal of Animal Ecology, Vol. 48, p 501-507, 1979. 2 fig, 2 tab, 19 ref.

Descriptors: *Growth rates, *Brown trout, *Water temperature, Mathematical models, Streams, Fish physiology, Water chemistry, Weight, Size, Fish populations, Chalk streams.

The maximum growth rates of brown trout have been computed from temperatures in rivers and streams of contrasting character and location, using a growth model for trout on maximum ration. The high growth rates of trout in chalk streams may be largely explained by their ambient temperature regime, principally its relatively homothermous character. Comparisons of observed and computed maximum growth rates, for the few locations where contemporaneous temperature and growth data are available, suggest that growth rates are generally between 60 and 90% of the computed maximum for that temperature regime and that this percentage is no higher in chalk streams. (Deal-EIS)
W79-10225

BIOASSAY OF BALTIMORE HARBOR SEDIMENTS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
C-F. Tsai, J. Welch, K-Y. Chang, J. Shaeffer, and L. E. Cronin.
Estuaries, Vol. 2, No. 3, p 141-153, 1979. 10 fig, 3 tab, 22 ref.

Descriptors: *Bioassay, *Bottom sediments, *Toxicity, Heavy metals, Chesapeake Bay, *Lead, *Chromium, *Zinc, *Cadmium, *Polychlorinated biphenyls, Mortality, Clams, Benthic fauna, Biological communities, Suspended solids, *Arsenic, Mummichog, Spot, Species diversity.

Baltimore Harbor, a tributary area of the northern Chesapeake Bay, has received and is receiving large quantities of chemical pollutants. Gross bioassay analyses were performed for sediments from nine representative stations, employing two species of fish, mummichogs (Fundulus heteroclitus) and spot (Leiostomus zanthurus), and one mollusc, the soft-shell clam (Mya arenaria). Acclimated organisms were exposed in static systems to a series of concentrations of suspended sediment from each station, to fuller's earth in suspension, and in control tanks for 48 hours. Parallel analysis of the sediment was performed for the metals, Pb, Cr, Zn, Cd, As, for PCB's and for hexane extracts. The sediments were all substantially polluted with low correlations among components. Twenty-four TLm and 48-hour TLm increased proportionately with sediment concentration but display species specificity. The relationships observed permit use of mummichog data to index gross toxicity of sediments throughout the harbor. Further comparison of mummichog 24-hour TLm value with benthic species diversity determined in a previous study permitted zoning of the entire harbor into highly toxic, moderately toxic, low toxic and slightly toxic zones. Gross toxicity of sediments determined by bioassay can therefore be used as an index of the suitability of the sediments for benthic macroinvertebrate communities. (Deal-EIS)
W79-10227

THE DETECTION OF MUTAGENIC CHEMICALS IN THE TISSUE OF THE MUSSEL MYTILUS EDULIS,
University Coll. of Swansea (Wales). Dept. of Genetics.
J. M. Parry, and M. A. J. Al-Mossawi.
Environmental Pollution, Vol. 13, p 175-186, 1979. 1 fig, 8 tab, 5 ref.

Descriptors: *Genetics, *Mussels, Chemical properties, E coli, Amino acids, Bacteria, Yeasts, Chemical analysis, Animal physiology, Biochemistry, Methodology, *Mutagens, *Tissue analysis.

Alcoholic extracts of the tissues of mussels collected from a number of sites were shown to contain chemicals capable of inducing mutation in bacteria and mitotic gene conversion in yeast. For samples derived from one of the genetically positive sites it was demonstrated that the active chemical is predominantly a frameshift mutagen and that the detectable activity was concentrated in the mantle tissue. (Deal-EIS)
W79-10228

THE DISTRIBUTION AND ABUNDANCE OF NEOMYSIS MERCEDIS IN RELATION TO THE ENTRAPMENT ZONE IN THE WESTERN SACRAMENTO-SAN JOAQUIN DELTA,
California Univ., Davis. Hydrobiology Lab.
C. A. Siegfried, M. C. Kopache, and A. W. Knight.
Transactions of the American Fisheries Society, Vol. 108, p 293-298, 1979. 5 fig, 27 ref.

Descriptors: California, *Sacramento River, San Joaquin Delta, Estuary, *Zooplankton, *Crustaceans, Mysids, Neomysis, *San Francisco Bay, Sampling, Current(Water), Flow, Flow rate, Salinity, Hydraulics, Animal populations, Reproduction, Juvenile stages.

The distribution and abundance of the opossum shrimp, Neomysis mercedis, was studied in a portion of the upper San Francisco Bay estuary in 1976, the fourth-driest year on record. For much of 1976 the entrapment zone, an area of zero net horizontal flow, was located in the study area. Variations in the annual abundance of N. mercedis can be related to the location of the entrapment zone. Juvenile mysids (about 3 mm long) tend to be higher in the water column during daylight than do mature mysids (about 7 mm long) leading to a geographic separation of these life stages. Estuarine hydraulics rather than salinity tolerance determines the distribution of N. mercedis in the study area. (Katz-EIS)
W79-10229

GROWTH RATES OF JUVENILE MAOMAO, ABUDEFDUF ABSOMINALIS, AT CONSTANT AND CYCLIC TEMPERATURES,
Hawaii Inst. of Marine Biology, Honolulu.
P. A. Medvick.
Transactions of the American Fisheries Society, Vol. 108, p 293-298, 1979. 1 fig, 29 ref.

Descriptors: *Water temperature, *Thermal stress, Juvenile fish, Marine fish, Commercial fish, Laboratory tests, Bioassays, Fish food, *Aquiculture, Preferred temperature, Growth rates, Cyclic temperatures, Maomao.

Growth rate and growth efficiency of juvenile maomao are related to temperature. Isolated fish were grown at six temperature regimes (constant: 23.4, 26.4, 29.4, 32.4 C; daily cyclic: 23.4-29.4 C, 26.4-32.4C) and at three food rations. Growth rates (wet weight) of fish fed ad libitum were greatest at the two highest constant temperatures which are near the species' preferred temperature of 30.1 C. At two lower rations fastest growth occurred at 26.4C. Growth rates in cyclic temperatures were not significantly different from those at constant temperatures equivalent to the mean temperature of the cycle. Maomao fed limited rations at cyclic temperatures which bracketed the preferred temperature grew at rates near the maximum for limited rations, indicating little, if any, energy penalty for living at cyclic temperatures. (Katz-EIS)
W79-10230

STUDIES OF HERBICIDE TOXICITY IN SOME FRESHWATER FISHES AND ECTOPROCTA,
Vikram Univ., Ujjain (India). School of Studies in Zoology.
K. S. Rao, and N. K. Dad.
Journal of Fish Biology, Vol. 14, p 523-527, 1979. 4 tab, 25 ref.

Descriptors: *Pesticide toxicity, *Freshwater fishes, *Herbicides, Fish physiology, Chlorinated hydrocarbon pesticides, Dalapon, 2,4-D, Mortality,

Organophosphorus pesticides, Dieldrin, Chemical properties, *Tafazine, *Blades, *Aresin, Bioassay.

The results of studies on herbicides toxicity to fish and freshwater Ectoprocta are reported. The effects of herbicides, viz, Tafazine, Bladex, Aresin and Dalapon were studied on Sarotherodon mossambicus, Puntius ticto, Cirrhinus mrigala, Danio sps., Heteropneustes fossilis, and Channa punctatus, S. mossambicus was more susceptible to Tafazine toxicity. Danio sps. was more resistant to Tafazine than S. mossambicus, but P. ticto had the maximum tolerance. S. mossambicus had greater resistance to Bladex than C. mrigala. C. punctatus was resistant to Aresin toxicity. Herbicide toxicity to freshwater Ectoprocta was noted with reference to Planavin, Bladex, Tafazine, and 2,4-D butyl ester and mixtures of Planavin + Mercuric chloride and Planavin + Bladex. Herbicide toxicity effected the leptoblasts of Plumatella casmiana and spinoblasts of Lophopodella carteri. (Deal-EIS)
W79-10231

THE RATE OF COLONIZATION BY MACRO-INVERTEBRATES ON ARTIFICIAL SUBSTRATE SAMPLERS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
P. G. Meier, D. L. Penrose, and L. Polak.
Freshwater Biology, Vol. 9, p 381-392, 1979. 4 fig, 2 tab, 23 ref.

Descriptors: *Sampling, *Research equipment, *Aquatic insects, Monitoring, On-site data collections, Invertebrates, Biological communities, Detritus, Periphyton, Insects, Diptera, Growth stages, *Species diversity.

The influence of exposure time upon macro-invertebrate colonization on modified Hester-Dendy substrate samplers was investigated over a 60-day period. The duration of exposure affected the number of individuals, taxa and community diversity. The numbers of individuals colonizing the samplers reached a maximum after 39 days and then began to decrease, due to the emergence of adult insects. Coefficients of variation for the four replicate samples retrieved each sampling day fluctuated extensively throughout the study. No tendencies toward increasing or decreasing coefficients of variation were noted with increasing time of sampler exposure. The number of taxa colonizing the samplers increased throughout the study period. The community diversity index was calculated for each sampling day and this function tended to increase throughout the same period. This supports the hypothesis that an exposure period of 6 weeks, as recommended by the United States Environmental Protection Agency, may not always provide adequate opportunity for a truly representative community of macro-invertebrates to colonize multiplate samplers. (Deal-EIS)
W79-10232

GASTRIC EVACUATION IN PLAICE, PLEURONECTES PLATESSA L.; EFFECTS OF TEMPERATURE AND MEAL SIZE,
Glasgow Univ. (Scotland). Dept. of Zoology.
M. Jobling, and P. S. Davies.
Journal of Fish Biology, Vol. 14, p 539-546, 1979. 4 fig, 2 tab, 27 ref.

Descriptors: *Fish physiology, *Water temperature, Digestion, Fish diets, Food habits, Fish farming, Enzymes, Chemical analysis, Animal metabolism, Mathematical studies, *Plaice.

The pattern of gastric evacuation in the plaice can be described by a single curve of curvilinear form, relating the amount of food remaining in the stomach and the post-prandial time. This curve can be transformed to linear form, conforming to a volume dependent model of evacuation. This allows the calculation of the time for complete evacuation of the stomach. The shape of the gastric evacuation curve is unchanged by the size of the meal fed. With increase in temperature however, the form of the curve does change, resulting in shorter times for complete evacuation. (Deal-EIS)
W79-10234

PREDICTION OF POLLUTANT RELEASE RESULTING FROM DREDGING,
Army Engineer District, New Orleans, LA.
C. Grimwood, and T. J. McGhee.
Journal of the Water Pollution Control Federation, Vol. 51, No. 7, p 1811-1815, July 1979. 2 fig, 1 tab, 11 ref.

Descriptors: *Dredging, *Pollutants, *Sampling, *Chemical analysis, Water pollution, Water pollution sources, Coasts, Nitrogen, Chemical oxygen demand, Arsenic compounds, Cadmium, Copper, Chromium, Lead, Mercury, Nickel, Zinc, Phenols, Chemicals, Effluents, Data processing, Analytical techniques.

The standard elutriate test was used to simulate the quality of the effluent during dredging operations and is generally reasonably accurate. In this paper, data collected at 5 southern Louisiana locations were analyzed to assess the predictive value of the test as a tool for estimating pollutant release. The Kolmogorov-Smirnov two-sample test was used to test the correspondence of pollutant release in the dredge effluent and standard elutriate test for total Kjeldahl nitrogen, chemical oxygen demand, cyanide, arsenic, cadmium, copper, chromium, lead, mercury, nickel, zinc, and phenol. It was found that for chemical oxygen demand, chromium, cadmium, and phenol--and to a lesser degree for total Kjeldahl nitrogen, arsenic, nickel, and zinc--the test afforded a useful prediction of release. The relative failure of the test with respect to lead, mercury, and a copper was a result, in part, of adsorption of these materials by the suspended sediment. (Sims-ISWS)
W79-10256

SURFACE TENSION OF A POLLUTED RIVER WATER,
National Inst. for Environmental Studies, Yatabe (Japan).
Y. Ambe.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewardte Limnologie, Vol. 20, Part 3, p 1934-1940, 1978. 9 fig, 1 tab, 11 ref.

Descriptors: Metals, *Copper, *Lead, *Chromium, *Nickel, *Cadmium, Detergents, *Surface tension, Surfactants, Japan, River Tamagawa, Foaming, *Foam fractionation, Foam separation, Water pollution effects.

A change of surface tension of the River Tamagawa was caused by wastes. The middle and lower parts of the river receive the pollution from a population of 1.5 million. The surface tension of the polluted water was measured in the laboratory. The surface tension of the river water decreased as the content of the methylene blue active substances increased. The foaming property of the water was correlated to surface tension. The foam was enriched with particulate matter and the foam concentrated dissolved organic carbon substances and heavy metals. Heavy metals collected in the foam were copper, lead, chromium, nickel and cadmium. (Katz-EIS)
W79-10269

CHANGES IN THE AMOUNT OF ORGANOCHLORINE PESTICIDES IN MACROINVERTEBRATE COMMUNITIES OF THE VAL PARMA RUNNING WATERS (ITALY),
Parma Univ. (Italy). Lab. di Ecologia.
P. F. Ghetti, G. Campanini, and J. Gorbi.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewardte Limnologie, Vol. 20, Part 3, p 1976-1987, 1978. 4 fig, 4 tab, 34 ref.

Descriptors: Benthos, Water pollution effects, Water pollution sources, Lipids, Chemical analysis, Benthos, Macroinvertebrates, Monitoring, *DDT, DDD, DDE, *Dieldrin, *Heptachlor, Aquatic insects, Oligochaetes, Val Parma, Italy, Insecticides, Chlorinated hydrocarbon pesticides, *Aldrin.

The analysis of macroinvertebrates is useful in determining which types of organochlorine products are used in the drainage basins. The correlation of pesticides to the lipid contents of organisms is of value. The determination of organochlorine products in animal tissues can be standardized as a monitoring procedure. Studies were made in four watersheds of the Val Parma, Italy. Chlorinated hydrocarbon pesticides were found in all samples. Benzene, hexachloride, heptachlor, aldrin, dieldrin, DDT, DDD, and DDE were found in the macroinvertebrates. (Katz-EIS)
W79-10270

EFFECTS OF EFFLUENTS FROM A VARIETY OF SEWAGE TREATMENT METHODS ON PRIMARY PRODUCTIVITY, RESPIRATION AND ALGAL COMMUNITIES IN ARTIFICIAL STREAM CHANNELS,
Norsk Inst. for Vannforskning, Blindern.
T. S. Traaen.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewardte Limnologie, Vol. 20, Part 3, p 1767-1771, 1978. 3 fig, 5 ref.

Descriptors: Benthos, Benthic algae, *Eutrophication, *Sewage effluents, Sewage disposal, Sewage treatment, Nutrients, Phosphorus, Laboratory experiments, Methodology, Water pollution sources, Water pollution effects, *Primary productivity, Benthic community, Phosphorus removal, Artificial stream channels.

Experiments were conducted in experimental channels to evaluate the biological effects of effluents from several sewage treatment methods including chemical treatment, combined biological and chemical treatments and pure phosphate additions. Benthic communities in the experimental channels were sensitive to small effluent loads. The primary productivity and community respiration responded markedly to effluent loading. The effluent loads caused qualitative changes in the benthic biota. Different biotic communities were typical of different loading levels. Efficient phosphorus removal reduced the eutrophication symptoms. (Katz-EIS)
W79-10271

SUCCESSION OF PHYTO- AND ZOOPLANKTON IN A WASTEWATER STORAGE RESERVOIR,
Mekorot Water Co., Tel Aviv (Israel).
J. Eren.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1976-1979, 1978. 3 tab, 5 ref.

Descriptors: Waste water, Sewage treatment, *Secondary treatment, Reservoir, Water supply, Algae, *Phytoplankton, Chlamydomonas, *Zooplankton, *Daphnia, Brachionus, Kfar Hasidim Reservoir, Cladocera, Nutrients, Eutrophication, Israel.

Storage of secondary treated wastewater in an open reservoir can provide clean water for summer irrigation. After initial development of dense population of Chlamydomonas and Euglena, there was decline in algal density. During the irrigation season the algal biomass was 1-2 mg (dry weight) per liter, mostly Ankistrodesmus. Herbivorous zooplankton consisted mainly of Daphnia and Brachionus. Toward end of the summer there was a decrease in zooplankton followed by a secondary algal bloom dominated first by Euglena and later by Spirulina. During the entire storage period the reservoir contained dissolved oxygen and no odor or other nuisances were reported. (Katz-EIS)
W79-10272

PHENOMENOLOGY AND MODELLING OF HEAVY METAL DISTRIBUTION IN LAKES,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
P. Baccini, H. Hohl, and T. Bundi.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewardte Limnologie, Vol. 20, Part 3, p 1971-1975, 1978. 4 tab, 15 ref.

Descriptors: Metals, *Copper, *Zinc, *Cadmium, *Lead, Ligands, Allochthonous matter, Buffer, Lakes, Lake water, Buffering, Path of pollutants, Algae, Phytoplankton, Model studies, Thermodynamic behaviour.

The sedimentation of trace metals, Cu, Zn, Cd and Pb is dominated by allochthonous particles. The biogenic particularization is partially reversed by lake internal decomposition processes. In the Lake of Alpnach and the Lake of Biel a model study predicts that an increase of the total metal concentration by a factor of 3 increases the copper content of the plankton by a factor of four. Neither the particulate allochthonous matter nor the dissolved ligands are able to buffer sufficiently the addition of inorganic copper. (Katz-EIS)
W79-10273

PONTOPOREIA DISTRIBUTION ALONG THE KEWEENAW SHORE OF LAKE SUPERIOR AFFECTED BY COPPER TAILINGS),
Michigan Technological Univ., Houghton, MI. Dept. of Biological Sciences.
K. J. Kraft.
Journal of Great Lakes Research, Vol. 5, p 28-35, 1979. 5 fig, 3 tab, 27 ref.

Descriptors: *Copper, Metals, *Lake Superior, Keweenaw Waterway, Water pollution sources, Water pollution effects, Sediment, Benthos, Crustaceans, Amphipoda, *Pontoporeia, On-site-investigation, *Copper tailings, Mining, Mining wastes, Nutrients, Animal populations.

The sediment and benthic macroinvertebrates of a 540 sq km area of Lake Superior were examined. The amphipod Pontoporeia hoyi was by far the most abundant animal collected. A 42 sq km area devoid of P. hoyi was found near where 50 million tons of copper tailings containing metallic copper in concentrations averaging 3750 mg/kg had been dumped between 1895 and 1968. In the no-amphipod region sediment copper ranged from 395 to 1310 mg/kg, while elsewhere mean levels were 14 to 298 mg/kg. The study area was divided into five transects which had maximum densities of P. hoyi ranging from 470 to 4480 sq m. The depth of maximum density ranged from 40-45 to 60-65 m. Maximum density was associated with a mean grain size of phi 3.5-4.0 and elevated levels of total volatile solids, nitrogen, phosphorus, and chemical oxygen demand. Copper and dark color, characteristics of the copper tailings, showed significant negative correlations with P. hoyi density. (Katz-EIS)
W79-10274

PHYTOPLANKTON POPULATION DYNAMICS AND PRODUCTIVITY IN A SEWAGE-ENRICHED TIDAL CREEK IN NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. G. Sanders, and E. J. Kuenzler.
Estuaries, Vol. 2, p 87-96, 1979. 9 fig, 3 tab, 31 ref.

Descriptors: *Phytoplankton, *Eutrophication, *Nutrients, *Sewage, Sewage effluents, Plant populations, Calico Creek, Salt marsh, Spartina marsh, Tidal marshes, On-site-investigation, Algae, Chlorophyll, Salinity, Hydrogen ion concentration, Dissolved oxygen, Tides, Tidal marshes.

Calico Creek differs from neighboring estuaries in that it receives sewage effluent, and its waters therefore contain ample nutrients. High nutrient levels enable the phytoplankton population, which is probably light-limited, to reach densities of a thousand billion cells/l during the summer, 2 to 3 orders of magnitude higher than the surrounding, nutrient-limited populations. At cell densities greater than 10 million cells/l the number of dominant species is greatly reduced, and the level of diversity drops sharply. Calico Creek also differs by being very shallow; the population can be drastically affected by high runoff. The productivity of both the phytoplankton and the surrounding Spartina marsh is much higher than the neighboring unpolluted estuaries. Unlike the larger and more stable estuaries nearby, the dependence of the population on the effluent for nutrients, the possibility of toxic materials entering the creek with the effluent, and its small size make Calico Creek subject to sudden change. (Katz-EIS)
W79-10275

INHIBITION OF ESTUARINE BACTERIA BY METAL REFINERY EFFLUENT,
Hull Univ. (England). Dept. of Plant Biology.
R. Goulder, A. S. Blanchard, P. J. Metcalf, and B. Wright.
Marine Pollution Bulletin, Vol. 10, p 170-173, 1979. 2 fig, 1 tab, 15 ref.

Descriptors: Metals, *Copper, *Arsenic, *Hydrogen, *Ion concentration, Bacteria, *Toxicity, Inhibition, Laboratory tests, Metal refinery effluent, Industrial wastes, England, Humber estuary, Bacterial activity, Acid water, *Cadmium, *Lead, *Zinc.

Water samples from the Humber Estuary adjacent to a discharge of metal refinery effluent were found to have high dissolved metal concentrations and low pH. Bacterial activities and concentrations of viable bacteria were low, indicating inhibition of bacteria and reduction in self-purification. Toxicity tests demonstrated that acid conditions and copper and arsenic amongst metals probably contributed to bacterial inhibition. Cadmium, lead and zinc were also present. (Katz-EIS)
W79-10277

SEXUAL MATURATION AS A SOURCE OF VARIATION IN THE RELATIONSHIP BETWEEN CADMIUM CONCENTRATION AND BODY WEIGHT OF MYTILUS EDULIS L.,
Institut National de la Recherche Scientifique, Rimouski (Quebec). Lab. Oceanographique.
D. Cossa, E. Bourget, and J. Piuze.
Marine Pollution Bulletin, Vol. 10, p 174-179, 1979. 2 fig, 1 tab, 7 ref.

Descriptors: *Cadmium, Metals, *Mussels, Mytilus, *Monitoring, Indicator species, Animal physiology, Gulf of St Lawrence, Chemical analysis, Tissue concentration, Juvenile growth stage, Metabolism, On-site-investigation, Water pollution effects, Path of pollutants.

In order to refine the utilization of Mytilus edulis as a pollution indicator species, the relationship between cadmium concentration and mussel body weight was investigated at different sites in the Estuary and Gulf of the St. Lawrence. The data show that the regression coefficients become considerably more variable when animals enter adulthood and that the variations are probably related to biochemical changes occurring during the sexual cycle. A substantial improvement of the applicability of mussels for monitoring marine pollution can be achieved by using only immature animals. This should reduce the influence of metabolism on the metal content of mussels and thereby give a more precise indication of ambiant pollution levels. (Katz-EIS)
W79-10278

THE INFLUENCE OF SALINITY ON GROWTH AND STRUCTURE OF EPIDERMAL PAPILLOMAS OF THE EUROPEAN EEL ANGUILLA ANGUILLA L.,
Hamburg Univ. (Germany, F.R.). Inst fuer Hydrobiologie und Fischereiwissenschaft.
G. Peters, and N. Peters.
Journal of Fish Diseases, Vol. 2, p 13-26, 1979. 7 fig, 2 tab, 18 ref.

Descriptors: *Eels, *Animal diseases, *Fish diseases, *Pathology, *Salinity, *Environmental effects, Anguilla, Water properties, Laboratory tests, Tumours, Cauliflower disease, Histology, Fish physiology, Neoplasms, Electron microscopy, Inhibition, Analytical techniques, Water quality, Fresh water, Biochemistry.

Papillomatosis of the European eel Anguilla anguilla occurs predominantly in waters of low to medium salinity (3-20 ppth). Tumour-bearing eels were kept under laboratory conditions for several weeks in salt concentrations of 8, 15 and 30 ppth. As opposed to those kept in freshwater, the experimental animals showed significant decreases in tumour growth rate. At the same time the tumour tissue underwent a marked redifferentiation, i. e. the originally poorly differentiated neoplastic tissue developed numerous mucous and club cells. The characteristic intercellular spaces of tumorous tissue disappeared with the formation of regular membrane interdigitations between adjacent cells. The nucleus to cytoplasm ratios of the neoplastic cells decreased to one-third of those of the untreated tumour. These changes resulted in a reversion of the neoplastic tissue to a structural condition essentially similar to that of normal epidermis. After a period of 2 to 3 months an adaptation to the altered salinity of the external medium was evident in that the tumorous tissue began to return to its original state. (Katz-EIS)
W79-10279

HYDROBIOLOGICAL AND CHEMICAL RESPONSE TO THE ADDITION OF IRON AND ALUMINUM SALTS, STUDIED IN THREE LUND-TYPE BUTYLRUBBER RESERVOIRS,
Koudekerk a/d Rijn (The Netherlands).
B. A. Bannink, and J. C. van der Vlugt.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, part 3, p 1816-1821, 1978. 5 fig, 14 ref.

Descriptors: Chlorophyll, *Phytoplankton, Water quality, Water analysis, *Iron, *Iron compounds, *Aluminum, Dodrecht, The Netherland, The Rhine River, Water chemistry, Water management(Applied), Water pollution effects, Water pollution treatment, Water purification, Water storage, Water supply, Water treatment.

On the basis of field experiments in the storage reservoir 'Grote Rug' near Dovdrecht, it was concluded that adding iron was a feasible and effective method of controlling algal biomass and thus maintaining an acceptable water quality in reservoirs which were fed by the River Rhine. The parameters measured in the experimental aquaria were chlorophyll and phosphorus. Changes observed as the result of various chemical treatment of iron were measured. (Katz-EIS)
W79-10280

LIMNOLOGICAL OBSERVATIONS ON A RECENTLY DREDGED POND (GRAVEL-PIT),
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (Germany, F.R.).
M. W. Banoub.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1844-1849, 1978. 5 fig, 1 tab, 2 ref.

Descriptors: *Ponds, *Water quality, Chlorophyll, *Primary productivity, Carbon, Particulate organic carbon, Chlorophyll maximum, Water temperature, Alkaline, Silicates, Carbon dioxide, Nitrates, Nitrites, Ammonium, Compounds, Dredging, Aquifers, *Phytoplankton.

A newly dredged pond was studied for the natural developments as well as the effect on surrounding aquifers. Measured were changes in water temperature, alkalinity, carbon dioxide, silicates, calcium, nitrates, nitrites, and ammonium. The annual cycles of chlorophyll, particulate organic carbon primary productivity and heterotrophic activities were measured. The pond in its present state is meso- to eutrophic. (Katz-EIS)
W79-10281

SOME ECOLOGICAL LIMITS OF TOLERANCE OF OCHROMONAS SOCIABILIS,
Konstanz Univ. (Germany, F.R.). Dept. of Biology.
R. Bretthauer.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1850-1854, 1978. 3 fig, 1 tab, 12 ref.

Descriptors: Algae, *Phytoplankton, Flagellates, Ochromonas, *Nutrients, *Ammonium compounds, Nitrogen, Nitrate, *Nitrogen compounds, Water temperature, Water pollution effects, Bioassays, Laboratory tests, Ecological limits, Hydrogen ion concentration, Dissolved oxygen, Water quality.

The ecological limits of tolerance of Ochromonas sociabilis to ammonium, nitrite and nitrate and the

optimum values have been analyzed in laboratory experiments. Optimum temperature was about 30 degrees C. Without the addition of ammonia the population growth is limited, 50-100 mg NO3-N/l accelerated the growth of Ochromonas, and 5 mg NO2-N/l intensified population growth. (Katz-EIS)
W79-10283

DEVELOPMENT OF PLANKTONIC ALGAE IN THE RUHR RIVER DEPENDENT ON NUTRIENT SUPPLY, WATERFLOW, IRRADIANCE AND TEMPERATURE,
Ruhr River Association, Essen (Germany, F.R.). Chemical and Biological Lab.
E. A. Nusch.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1837-1843, 1978. 9 fig, 7 ref.

Descriptors: *Phytoplankton, Algae, Ruhr River, *Nutrients, Bioassays, Water quality, Meteorologic data, Hydrologic data, Water chemistry, *Phosphates, Biomass, Primary productivity, Water temperature retention, Water pollution effects, Water pollution sources, Laboratory tests, Scenedesmus, Nitrates, Chlorophyll, *Nitrates.

It is demonstrated that algal growth, especially the mass development of planctonic algae in the Ruhr River is still dependent on nutrient supply. Even if the phosphate concentrations exceed by far the limits to achieve maximum growth rate the maximum yield of algal biomass is determined by the nutrient supply if other influential parameters, e.g. low water flow (i.e. sufficient retention time), irradiance and water temperature, are favourable. The actual N:P ratio in Ruhr River water is near the optimum for algal growth. At high phosphate levels nitrate has a nutritional effect. To abate excessive algal growth in Ruhr River water or to prevent at least the frequent occurrence of water blooms it is necessary to reduce the phosphate concentrations considerably below 0.5 mg/l PO4 3. (Katz-EIS)
W79-10284

SAPROBIOLOGICAL EVALUATION OF DUTCH DITCHES USING BENTHIC ALGAE ON ARTIFICIAL SUBSTRATES,
Water Board of the Rhine District, Leiden (Netherlands).
S. P. Klapwijk.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1811-185, 1978. 2 fig, 2 tab, 13 ref.

Descriptors: Phytoplankton, *Periphyton, *Methodology, Algae, Fresh water algae, Substrates, Plant communities, Research equipment, Research and development, Algal communities, Environmental effects, Water pollution effects, Water quality, Saprobic system, Ammonium salts, Saprobic index, Artificial substrates.

Artificial substrates are valid ecological methods for collecting algae in Saprobiological research. Artificial substrates eliminate difference in substrate preference, eliminate difference in the age of sampled algal communities, allow good observation and quantification, allow the integration of chemical and biological interaction between the environment and the algae. The saprobic system is less applicable to stagnant waters than for running waters and is more suitable for planktonic than for benthic algae. (Katz-EIS)
W79-10285

ORGANISM-SUBSTRATE RELATIONSHIP IN A SMALL DUTCH LOWLAND STREAM. PRELIMINARY RESULTS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Nature Conservation.
H. H. Tolkamp, and J. C. Both.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie. Vol. 20, Part 3, p 1509-1515, 1978. 1 fig, 3 tab, 23 ref.

Descriptors: *Invertebrates, *Benthos, Sampling, Streams, *Substrates, *Sediments, Sands, Litter, Oligochaetes, Crustaceans, Aquatic insects, Water pollution effects, Methodology, Leaves.

An intensive sampling program of the benthos of the Snijdersveerbeek in relation to the substrate was made. Fauna associated with bare sand is poor in individuals although there are some species that prefer this habitat. Leaves support a rich community of species and some species are restricted to this habitat. Different substrates are preferred by different taxa. The influence of life-stage or the microdistribution of macro-invertebrates has been reported. (Katz-EIS)
W79-10289

EFFECTS OF SELFPURIFICATION AND THE BENTHIC ORGANIC LOAD ALONG A STREAM POLLUTED BY A PIGGERY, (IN FRENCH),
Centre Universitaire de Chambery (France).
D. Fontvieille.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1789-1795, 1978. 2 fig, 1 tab, 32 ref (English summary).

Descriptors: *Water pollution effects, Water pollution sources, Streams, Sediments, Organic loading, *Organic wastes, *Piggery, *Self-purification, Biomass, Primary productivity, Benthic load, Macroinvertebrates, Bacteria, Benthic biomass, Animal wastes.

The mean organic loads in the water and the sediment of a brook polluted by pigsty wastes are compared from the point of contamination down to that of nearly complete recovery. Between these two points, the per cent kilometric decrease in organic load is similar for both media. The input of 300 times the benthic energetic load magnifies 3 times the biomass in the upper stations. The ratio of the biomass to the total benthic load is greatest after the water has flowed for 3.30 h. The respired energy to total benthic load ratio continually increases during the 5.30 h drainage time. The efficiency of the self purification also reaches its maximum in the last station downstream. (Katz-EIS)
W79-10290

MINERAL AND PURINIC BIOACCUMULATION IN AQUATIC INSECTS,
Laboratoire d'Histophysiologie des Insetes Paris (France).
D. Lhonore.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 4, p 2652-2655, 1978. 2 tab, 7 ref.

Descriptors: *Aquatic insects, Benthos, Chemical analysis, Spectrophotometry, Calcium, Magnesium, Manganese, *Iron, Phosphorous, Potassium, *Zinc, Chloride, Tissue content, France, Path of pollutants.

The use of cytochemical and x-ray spectography allows the location and chemical identification of mineral and purinic concentration in tissues of aquatic insects. The most common elements in insect larvae from unpolluted streams are calcium, magnesium, manganese, iron, phosphorous and sometimes potassium, zinc and chlorides. These elements are found in the eye, epidermis, fat body, midgut and Malpighian tubules. (Katz-EIS)
W79-10292

INDICATOR COMMUNITIES OF OLIGOCHAETES IN SCANDINAVIAN LAKES,
Uppsala Univ. (Sweden). Inst. of Zoology.
G. Milbrink.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 4, p 2406-2411, 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Oligochaetes, *Water quality, Nutrients, *Benthos, Freshwater benthos, *Animal grouping, Eutrophication, Oligotrophy, Sweden, Lakes, Mesotrophy, Water pollution effects.

An attempt is made to correlate distribution of various species of oligochaetes in water with different limnological parameters including water pollution. Although some species of oligochaetes are probably tolerant of pollution, there is still not sufficient data before a standardized use of oligochaetes, to evaluate water quality is possible in Swedish water. (Katz-EIS)
W79-10293

EFFECT OF A STEAM ELECTRIC GENERATING STATION ON THE EMERGENCE TIMING OF THE MAYFLY, HEXAGENIA BILINEATA (SAY),
Oak Ridge National Lab., TN.
J. S. Mattice, and L. L. Dye.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1752-1758, 1978. 4 fig, 1 tab, 15 ref.

Descriptors: *Benthos, *Mayflies, Aquatic insects, *Water temperature, *Thermal power, Hexagenia, Animal growth, Animal behavior, Animal physiology, Reproduction, Emergence, Emergence timing, Kingston Steam Plant, Clinch River, Seasonal temperature, Steam electric generating station, Water pollution source.

Laboratory studies indicate that the growth and emergence of Nexagenia occur faster at 25 degrees than 15 degrees. The changes in the timing of emergence correlate well with the hypothesis of temperature causation. The accelerated emergence in the discharge cone of the Kingston Steam Plant is probably not significant for mayfly populations of the whole reservoir and is localized and would not translate to ecosystem changes of predator populations. (Katz-EIS)
W79-10296

A SCANNING ELECTRON MICROSCOPIC STUDY OF PERIPHYTON COLONIZATION IN A SMALL STREAM SUBJECTED TO SODIUM CHLORIDE ADDITION,
Brock Univ., St. Catharines (Ontario). Dept. of Biological Sciences.
M. D. Dickman, and M. B. Gochnauer.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1738-1743, 1978. 3 fig, 5 tab.

Descriptors: *Salinity, *Chlorides, *Freshwater, Water pollution effects, Water pollution sources, Algae, Plant populations, Bacteria, On-site-investigation, Electron microscopy, Benthos, Invertebrate, Algal diversity, Algal density, Fungal parasitism, Invertebrate herbivores, *Periphyton.

The addition of 1,000 ppm sodium chloride to a small stream in order to simulate road salt loading resulted in a reduction in algal density and an increase in bacterial density during a four week exposure period. The scanning electron microscope was used to identify changes in the spatial pattern of periphyton community structure using specially prepared slate substrates which were placed in the stream at the onset of the study. Phytophagous invertebrates increased algal diversity at the control station by preventing the dominant alga, Cocconeis placentula, from crowding out the other algal colonizers. Algal diversity remained lower at the salt stressed station as did algal density, fungal parasitism and invertebrate herbivory throughout the four week experiment. (Katz-EIS)
W79-10297

EFFECTS OF PULP MILL AND MUNICIPAL EFFLUENTS AND HUMUS LOAD ON THE MACRO- AND MEIOZOOBENTHOS OF SOME FINNISH LAKES,
Jyvaskyla Univ. (Finland). Dept. of Hydrobiology.
L. Paasivirta, and J. Sarkka.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie. Vol. 20, Part 3, p 1779-1788, 1978. 6 fig, 2 tab, 21 ref.

Descriptors: *Water pollution effects, Benthos, *Macrobenthos, *Meiozoobenthos, Finland, Kymijok, Water course, Animal populations, Domestic wastes, Sewage, Humus, Water quality, *Pulp and paper industry, Oxygen, Water color, Seasonal

changes, Biomass, Animal communities, Methodology.

The effects of effluents from pulp and paper mills on the macro- and meiozoobenthos in Finnish lakes with different humus contents were studied. The qualitative and quantitative differences between the benthic animal communities of the stations studied support the usefulness of zoobenthos on the assessment of pollution and the humus load of lakes. The varying occurrence of species at the various stations makes it possible to create species groups in relation to ecologically important environmental factors. There are also groups of species that seem to be indifferent to environmental changes. (Katz-EIS)
W79-10298

EFFECT OF AGE, WEIGHT, AND SEX ON THE MERCURY CONTENT IN THE MUSCLES AND SELECTED ORGANS OF NORTHERN PIKE (ESOX LUCIUS L.), (IN POLISH),
Instytut Technologii zym Zywnosci Pochodzenia Morskiego, Szczecin (Poland).
M. Protasowicki, and A. Ociepa.
Zeszyty Naukowe Akademii Rolniczej W Szczecinie, No. 7, p 145-155, 1978. 4 tab, 19 ref. (English Summary).

Descriptors: *Mercury, Metals, Water quality, *Pike, Chemical analysis, Poland, Lake, Dabie, *Tissue concentration, Spectrophotometry, Age, Weight, Sex, Muscle content, Path of pollutants, Esox lucius.

Investigations were made of 30 samples of pike from Lake Dabie. Mercury content was determined in muscle, kidney, liver, intestine, spleen, gills and gonads. Determination was done by flameless atomic absorption spectrophotometry using spectrophotometer Coleman MAS-50. It was found that mercury content in muscle and other internal organs do not depend upon sex. However, it was demonstrated that this element level increases with age, weight, and length in muscle, kidney, liver, intestine, spleen, and gills. Average mercury content and confidence limits are the following: muscle - 0.220, kidney - 0.129, liver - 0.082, intestine - 0.057, spleen - 0.055, gills - 0.031, and gonads - 0.013 mg/kg. The mercury content in pike's organs is a result of the natural content of this element in water of Lake Dabie. (Katz-EIS)
W79-10299

PRELIMINARY EXPERIMENTS WITH SEA URCHIN PLUTEUS AND METAMORPHOSIS IN MARINE POLLUTION BIOASSAY,
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol. 24, p 9-21, 1977. 12 fig, 5 tab, 15 ref.

Descriptors: *Methodology, *Sea urchin, *Sand dollar, Marine benthos, Bioassay, Toxicity, Juvenile growth stage, Japan, Mercury, Copper, Zinc, Cadmium, Chromium, Detergents, Alkylbenzene, Sulfonate, Ammonia, Arsenic, *Water pollution effects.

Effects of some pollutants upon the pluteus formation in the sea urchin, Anthocidaris crassispina, were examined. Effects of some pollutants and polluted sea water upon the developmental stages from fertilization to metamorphosis in the sand dollar, Peronella japonica, were studied. The effects were more pronounced in the pluteus formation than in any other stages prior to it in Anthocidaris and Peronella. Throughout the whole stages from fertilization to pluteus formation, Peronella was seemingly more sensitive than Anthocidaris, the sensitivity was especially remarkable in the metamorphosis of Peronella. All these tendencies were demonstrated again in the tests with the polluted sea water samples from around Hatakejima Island. (Katz-EIS)
W79-10300

CONCENTRATIONS OF PCBS, BHCS AND DDTS RESIDUES IN SEAWEEDS OF THE EAST COAST OF SICILY,
Catania Univ. (Italy). Inst. di Chimica e Chimica Industriale.
V. Amico, G. Oriente, M. Piattelli, and C. Tringali.
Marine Pollution Bulletin, Vol. 10, p 177-179, 1979. 1 fig, 1 tab, 6 ref.

Descriptors: *Polychlorinated biphenyl, *Benzene, Hexachloride, *DDT, *DDE, *Seaweed, Marine algae, Path of pollutants, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, Sicily, On-site investigation, Chemical analysis, Rhodophyta, Phaeophyta, Clorophyta.

The levels of PCBs, DDT and BHC residues have been determined in thalli of 12 species of marine algae harvested along the east coast of Sicily. The results are discussed in comparison with those obtained earlier with animal species sampled in the same area. A closer comparison between the patterns of chlorinated hydrocarbons in seaweeds and those in mussel (and more loosely in other animal species) discloses some notable differences: (a) the ratio sigma DDT/sigma PCB is consistently lower in algae than in animals, whereas the opposite applies to the ratio sigma DDT/sigma DDE, and (b) the peak patterns of PCB obtained from seaweeds are not comparable in proportions with those from animals and are characterized by higher intensities of peaks of shorter retention time (less chlorinated biphenyls). (Katz-EIS)
W79-10301

EFFECT OF A PUMP-STORAGE HYDROELECTRIC SCHEME ON THE STRATIFICATION AND ECOLOGY OF A SCOTTISH LOCH,
Glasgow Univ. (Scotland). Dept. of Zoology.
R. Tippett.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 4, p 2697-2700, 1978. 3 fig, 2 ref.

Descriptors: *Phytoplankton, *Zooplankton, Fresh water, On-site investigation, Cladocena, Rotifers, Lakes, *Reservoirs, *Pumped storage, Pumping, Scotland, Cruachan pump-storage scheme, Loch Awe, Algae, Plant grouping, Community diversity, Diversity index.

A field study was conducted in 1975 and 1976 on the effects of the Cruachan Pump-Storage scheme on the limnology of Loch Awe in the north of Scotland. Phytoplankton and zooplankton were observed. Phytoplankton community diversity fell rapidly in the spring but steadily increased through the summer to more than 3 by the time stratification had broken down. The zooplankton community diversity appeared to be slightly higher in late spring and summer than other times. (Katz-EIS)
W79-10302

SOME PRELIMINARY DATA ON NUTRIENTS AND CHLOROPHYLL IN ORGANICALLY POLLUTED RIVERS (GRANADA/SOUTH SPAIN),
Granada Univ. (Spain). Dept. of Zoology.
R. Martinez.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewardte Limnologie, Vol. 20, Part 4, p 2722-2730, 1978. 7 fig, 6 ref.

Descriptors: *Nutrients, *Nitrates, *Phosphates, Chlorophyll, *On-site-investigation, Oxygen, Oxygen demand, Water pollution effects, Algae, Benthos, Bacteria, Industrial wastes, Organic wastes, Organic loading, Olive wastes, Granada, South Spain, Cubillas River, Olive-oil factories.

Two small rivers in the province of Granada (South Spain) have been surveyed, one of them showing heavy organic pollution from olive residues coming from olive-oil factories, and the other one being free from it. From December 1975 to May 1977 samples were taken every 20 days and several parameters were estimated, concerned to water chemistry, epilithic chlorophyll and bacterial, algal (diatoms) and bottom fauna populations. Some preliminary data presented referred to nutrients and chlorophyll, which show considerable differences between both rivers. The outstanding characteristic of the polluted stream was the low chlorophyll concentration during the pollution period. Low chlorophyll content was related to low nitrate content. Low oxygen content of the water was also observed. (Katz-EIS)
W79-10303

EFFECT OF HYDROLOGICAL CHANGES ON AQUATIC COMMUNITIES IN THE LOWER JORDAN RIVER,
Hebrew Univ., Jerusalem (Israel). Dept. of Zoology.
R. Ortal, and F. D. Por.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1543-1551, 1978. 4 fig, 2 tab, 5 ref.

Descriptors: Animal groupings, *Animal populations, Streams, Dams, Reservoirs, *Hydrology, Toxicity, Water temperature, Thermal water, Phenol, Benthos, On-site-investigation, *Jordan River, Israel, Water pollution effects, *Nutrients, Phosphates, Nitrogen compound, Formaldehyde.

The lower Jordan River, in Israel has undergone extensive changes due to water use. Most natural water is utilized and the remaining water is irrigation return water and wastes including agricultural drainage, fish pond wastes, domestic and industrial wastes. The animal communities of the lower Jordan River were sampled and the chemical and physical parameters were determined. Four factors influenced the lower Jordan River: hydraulics, thermosaline factor, nutrients and toxicity. Toxicity results from phenol and formaldehyde compounds whose influence is restricted to a short segment of the river mainly in the winter. (Katz-EIS)
W79-10304

INFLUENCE OF THE FISHSTOCK ON THE PHOSPHORUS-CHLOROPHYLL RATIO,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
J. Hrbacek, B. Desortova, and J. Popovsky.
Verhandlungen Internationale Vereinigung fur Theoretische und ungewandte Limnologie, Vol. 20, Part 3, p 1624-1628, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: *Nutrients, *Chlorophyll, Biomass, Primary production, Reservoir, Czechoslovakia, Rainbow trout, Brown trout, Daphnia, Fish management, *Fish populations, Fish harvest, Phytoplankton, Zooplankton, Phosphorous-chlorophyll ratio.

A study was made to determine the influence of fish stocks on the metabolism of reservoir communities. Reservoirs with a low fish stock showed in the course of two years a chlorophyll concentration of half those reservoirs with normal fish stocks. The relative amount of chlorophyll per unit of biomass in ponds with low fish stock was on the average about half the other reservoirs with larger fish stocks. (Katz-EIS)
W79-10305

CHANGES OF PHYTOPLANKTON COMPOSITION AND ITS CHARACTERISTICS DURING RED TIDE SEASON, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan). Water Quality Div.
T. Honjo, T. Shimouse, N. Ueda, and T. Hanaoka.
Bulletin of the Plankton Society of Japan, Vol. 25, p 13-19, 1978. 5 fig, 8 ref. (English Summary).

Descriptors: *Red tide, *Phytoplankton, Nutrients, Plant populations, Marine algae, *Diatoms, *Dinoflagellates, Japan, Hakata Bay, On-site-investigations, Nitrates, Phosphates, *Iron, Manganese, Chelation, Plant growth, Plant growth regulations, Daily changes.

An investigation was made during May and June, 1973, in the Hakozaki fishing port, Hakata Bay. Water samples were collected daily from the surface water, and identification of species and counts of the number of cells were carried out. These data were divided into four groups as diatoms, Heterosigma sp., large flagellates, and small flagellates. 1. Heterosigma sp. and large flagellates do not com-

pete with each other for growth. 2. Propagation of small flagellates declined temporarily with the growth of Heterosigma sp. but those of diatoms (S. costatum, Chaetoceros sp. and Thalassiosira sp) except Nitzschia sp. were inhibited completely during Heterosigma sp. red tide. On the other hand, filtrates (enriched N, P, Si, B12, Fe, Mn, EDTA) through membrane filter (0.45 micron in pore size) of water samples in the period of Heterosigma sp. red tide inhibited the growth of S. costatum but not the growth of N. closterium and Phaeodactylum tricornutum. Enriched filtrate of conditioned medium with Heterosigma sp. which has grown in the laboratory inhibited also the growth of S. costatum. These results obtained from the field and the laboratory suggest that Heterosigma sp. red tide might be able to inhibit growth of some diatoms and simplify the species composition in the water, being affected by an ectocrine which might be released from the red tide cells. (Katz-EIS)
W79-10306

SUITABILITY OF ACTIVATED AH-FILTERED WATER TO STUDY DEVELOPMENT OF SALMONID EMBRYOS, (IN POLISH),
Institute of Ichthyology, Szczecin (Poland).
Zaklad Anatomii i Embriologii Ryd.
W. Wawrzyniak, and A. Winnicki.
Zeszyty Naukowe Akademii Rolniczeu W Szczecinie, No. 70, p 41-49, 1978. 5 fig, 2 tab, 18 ref. (English Summary).

Descriptors: *Aquiculture, *Rainbow trout, Brown trout, Water quality, *Chlorine, *Activated carbon, Water filter, Carbon dioxide, Filtered water, Fish hatchery, Fish eggs, Fish physiology, Fish reproduction, *Fish pathology, Fish establishment.

Eggs of rainbow trout (Salmo gairdneri Rich.) and trout (Salmo trutta L.) were incubated in flowing water with chlorine removed by using a filter provided with activated carbon. Experiments and observations have shown a much higher occurrence of disturbed development, higher mortality and postponed development (ca 10%) to take place in flowing purified water. In the author's opinion, the facts observed are due to an oxygen deficiency and a higher CO2 content in the filtered water. The filter removes chlorine, suspensions etc., but without an additional treatment of the water, eggs of the species studied cannot be incubated. (Katz-EIS)
W79-10307

CHANGES IN DDT, DDE AND DDD CONTENTS DURING PRODUCTION OF CANNED HERRING (THE 'GDANSK HERRING'), (IN POLISH),
Instytut Technologii zym Zyrnosci Pochodzenia Morskiego, Szczecin (Poland). Zaklad Higieny Przemyslu Rybengo.
W. Ciereszko, D. Bobinska, and A. Chodyniecki.
Zeszyty Naukowe Akademii Rolniczej w Szczecinie, No. 70, p 139-145, 1978. 1 fig, 1 tab, 16 ref. (English summary).

Descriptors: *DDT, *DDE, *DDD, Public health, Water pollution effects, Path of pollutants, Chemical analysis, *Commercial fish, Food processing industry, Foods, Food web, Canned herring, Poland, Gdansk fisheries, Fish harvest.

An effect of each particular stage of canned herring production on DDT and its metabolites, DDE and DDD, contents was studied. The compounds studied were found to be present in every sample taken at each production stage as well as in the aromatised oil. The following contents of DDT, DDE, and DDD, respectively, were revealed in fresh Baltic herring flesh: 0.065, 0.046 and 0.067 mg/kg. No significant influence of salt-vinegar bathing on the contents of the compounds in question was noted, while after the steam treatment, as a result of drip, a total DDT content increased by 57.6% when compared to that in fresh fish. A relatively high DDT level was found in the aromatised oil whereby the final DDT content in a finished product increased to 0.302 mg/kg, i.r., the 78.7% increase was observed in relation to the original level in raw material. Thermal treatment was found to exert no significant effect upon the decrease of the studied compounds contents in fish and aromatised oil. (Katz-EIS)
W79-10308

INDICATOR VALUE OF FRESHWATER OSTRACODA,
Prague Dept. of Water Technology and Environmental Engineering (Czechoslovakia).
V. Sladecek.
Acta Hydrochimica et Hydrobiologica, Vol. 6, p 561-565, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Ostracods, *Monitoring, Benthos, Crustaceans, Europe, *Indicators, *Saprobic evaluation, Zooplankton, Water quality, Animal groupings, Animal populations, Dissolved oxygen, Oxygen requirements.

The saprobic evaluation of 35 species of ostracods common to central Europe is given. Ostracods are not present in highly polluted waters and the worst saprobic conditions they tolerate is the alpha-meso-saprobicity. Only a few species are able to survive long periods of oxygen exhaustion on the bottom. (Katz-EIS)
W79-10309

EXPERIMENTAL REARING OF RAINBOW TROUT (SALMO GAIRDNERI RICH.) IN COOLING WATERS OF 'DOLNA ODRA' POWER STATION),
Institute of Marine Biological Resources Exploitation and Protection, Szcecin (Poland).
R. Trzebiatowski, J. Filipiak, R. Jakubowski, and M. Seyda.
Acta Ichthyologica et Piscatoria, Vol. 7, p 32-40, 1977. 4 fig, 1 tab, 7 ref.

Descriptors: *Water temperature, *Aquiculture, *Cooling water, Power plants, Rainbow trout, Poland, Dolna Odra Power Station, *Fish farming, Hydrogen ion concentration, Fish physiology, On-site-investigation, Fish diets, Fish diseases.

The paper contains results of studies on cage rearing of rainbow trout in cooling waters of the 'Dolna Odra' power station. The experiments, concerning the 0+ young rainbow trout, were carried out during 65 days. Fish were fed on a trout pellet the portion given amounting to 3% of the current fish weight. From May through October the culture was run in a power station water-supplying channel. Water temperature in the test channels never exceeded 27 degrees C or fell below 10 degrees C. Water pH ranged within 7.2 - 8.4 except with one two week episode in which the pH exceeded 9.2 due to the addition of alkalizing chemicals. It was concluded that at temperatures lower than 20 degrees C the cooling waters were satisfactory to rear fish. (Katz-EIS)
W79-10310

CONCENTRATION FACTORS OF THE ELEMENTS COBALT, MANGANESE, IRON, ZINC AND SILVER FOR FISH,
Bundesforschunganstalt fuer Fisherei, Hamburg (Germany, F.R.). Istopenlaboratorium.
W. Feldt, and M. Melzer.
Archiv fur Fischerei Wissenschaft, Vol. 29, p 105-112, 1978. 5 fig, 1 tab, 5 ref.

Descriptors: *Cobalt, *Manganese, *Iron, *Zinc, *Silver, Freshwater fish, Chemical analysis, Water quality, Concentration factor, Bioaccumulation factor, Prediction, Fish flesh, Germany, Danube River, Elbe River, Neckar River, Rhine River, Weser River, Rainbow trout, Carp, Cod, Minnows, Commercial fish.

Fish and water were analyzed from different German rivers for the elements cobalt, manganese, iron, zinc and silver. The concentration factor (bioaccumulation factor) for fishflesh is inversely proportional to the element concentration in the unfiltered water. This pattern applied to elements that are homeostatically maintained at a constant concentration in organisms or tissues despite different concentrations of the elements in water. Mathematical equations have been derived from the investigations carried out to predict concentration factors for fishflesh from the knowledge of stable element concentrations in water. (Katz-EIS)
W79-10311

NEW TERMINOLOGY REQUIRED FOR SHORT-TERM STATIC FISH BIOASSAYS: LC(I)50,
Ministry of Agriculture, Fisheries and Food London (England). Salmon and Freshwater Fisheries Lab.
R. Lloyd, and T. E. Tooby.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 1-3, 1979. 4 ref.

Descriptors: *Methodology, *Toxicity, *Bioassay, Laboratory tests, *Monitoring, Chemical analysis, Chemical data, Physical data, Lethal concentration, Data collection, Data storage and retrieval, Chemical wastes, Chemical registration.

A terminology is suggested to express data from static fish bioassay tests in which the concentration of toxicant at the end of the test is decreased by over 10% from that concentration present at the beginning of the experiment. LC(I)50 is proposed. C(I) is derived from the initial concentration of test solutions. This procedure is used to differentiate data from tests in which the toxicant concentration did not decrease. (Katz-EIS)
W79-10312

THE EFFECT OF OSMOTIC STRESS ON THE SURVIVAL AND RESPIRATION OF THE STONEFLY NYMPH, PARAGNETINA MEDIA,
N. N. Kapoor.
Gewasser und Abwasser, Vol. 64, p 37-38, 1979. 3 ref.

Descriptors: *Benthos, *Aquatic insects, Animal physiology, *Salinity, Insect behavior, Insect resistance, Bioassay, Laboratory test, Saline water, Salt tolerance, *Stoneflies, Stonefly larvae, Stonefly nymphs, Paragnetina, Toxicity, Mortality.

Stonefly nymphs were exposed for 72 hours to media containing 0.0, 0.005, 0.01, 0.04, 0.12, 0.20, 0.95, 1.10 and 1.20 sodium chloride. The response of surviving nymphs was determined by observing changes in oxygen consumption and osmotality of urine and hemolymph. Nymphs of Paragnetina showed a good regulation of hemolymph through a media range of 0.12 - 0.95% NaCl. (Katz-EIS)
W79-10313

EFFECTS OF GRANULAR 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) ON BENTHIC MACROINVERTEBRATES IN A LAKE ENVIRONMENT),
National Fishery Research Lab., LaCrosse, WI.
P. A. Gilderhus.
Great Lakes Fishery Commission, Technical Report No. 34, p 1-5, 1979. 3 tab, 6 ref.

Descriptors: Toxicity, Mortality, *Benthos, Freshwater fish, Larvae, Juvenile growth stages, *Lampreys, Sea lamprey, Petromyzon, *Oligochaetes, Midge larvae, *Aquatic insects, Pesticides, Bayer 73, 2',5-Dichloro-4'-Nitrosalicylanilde, Macroinvertebrates, *Michigan, Boardman Lake, Amphipoda, Mayflies, Fish management, Water pollution sources, Water pollution effects.

Benthic organisms were collected before, and during the first 13 days after, treatment of a selected area of a lake with granular Bayer 73 for control of larval sea lamprey (Petromyzon marinus) to determine the effects of the treatment on invertebrates. Total numbers of organisms in the treated area dropped 56% in the first 7 days after treatment. Most of the reduction occurred among oligochaetes and midge larvae. Numbers of mayfly nymphs and amphipods were not substantially affected. Total numbers of organisms and numbers of oligochaetes and midge larvae increased between 7 and 13 days after treatment. Judging from this study, treatments with Bayer 73 are expected to have only moderate effects of short duration on populations of macroinvertebrates. (Katz-EIS)

W79-10314

EFFICACY OF ANTIMYCIN FOR CONTROL OF LARVAL SEA LAMPREYS (PETROMYZON MARINUS) IN LENTIC HABITATS,
National Fishery Research Lab., LaCrosse, WI.
P. A. Gilderhus.
Great Lakes Fishery Commission, Technical Report No. 34, p 6-17, 1979. 1 fig, 3 tab, 8 ref.

Descriptors: Freshwater fish, *Toxicity, *Mortality, Bioassay, *Lamprey, Petromyzon, Lakes, Charlevoix Lake, Ocqueoc Lake, Harlow Lake, *Lake Michigan, Lake Huron, Lake Superior, *Antimycin, Juvenile fish, Lake trials, Michigan, Rainbow trout suckers, Brown trout, Bass, Yellow perch, On-site-investigation, Water pollution effects, Water pollution sources.

Antimycin, in a delayed-release granular formulation, was shown to be effective for control of larval sea lampreys (Petromyzon marinus) in lentic habitats at treatment rates of 75 to 150 g of active ingredient per hectare. When the chemical was tested four inland lakes connected to the Great Lakes and known to harbor larval lampreys, about 90% or more of the larval lampreys present were killed by treatments of 150 g/ha (active ingredient). Treatment at 75 g/ha killed more than 90% in warm water but only 66% in cold water. Some small fish, mostly bottom-dwelling forms, were killed by the treatment. (Katz-EIS)
W79-10315

PHYSICAL AND CHEMICAL FACTORS AFFECTING FISH DISTRIBUTION IN LAKE MANZALAH-EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. D. Wahby, and N. F. Bishara.
Acta Ichthyologica et Piscatoria, Vol. 7, p 15-30, 1977. 1 fig, 4 tab, 54 ref.

Descriptors: *Water temperature, *Hydrogen ion concentration, *Dissolved oxygen, Marine fish, Freshwater fish, Brackish water fish, Environment, Environmental gradient, *Lake Manzalah, Egypt, Salinity, Fish populations, Commercial fish, Commercial fisheries, Mullets, Tilapia, Nile Delta, Seasonal distribution.

The fish distribution in Lake Manzalah, the largest of the Delta Lakes of Egypt, was studied and discussed in the light of the prevailing physical and chemical conditions. The lake-sea connection is of vital importance for the welfare of the lake and has a pronounced effect on the fish distribution. Many marine forms like Mugil cephalus, M. capito, Sciaena aquilla, Chrysophris aurata, Morone labrax, M. punctata and shrimps can tolerate the brackish water of the lake during certain phases of their life. Tilapia spp., namely Tilapia aurea, T. galilaea, T. nilotica and T. zillii being the principal fish in the lake have different degrees of salinity tolerance. The tolerate limits of different ecological factors like salinity, temperature, pH and dissolved oxygen was determined for different species of fish. (Katz-EIS)
W79-10316

A RED TIDE OCCURRED AT THE HAKOZAKI FISHING PORT, HAKATA BAY, IN 1973. THE GROWTH PROCESS AND THE CHLOROPHYLL CONTENT,
Tokai Regional Fisheries Research Lab., Tokyo (Japan). Water Quality Div.
T. Honjo, T. Shimouse, and T. Hanaoka.
Bulletin of Plankton Society of Japan, Vol. 25, p 7-12, 1978. 3 fig, 23 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *Red tide, Marine algae, Plant growth, Plant populations, Dinoflagellates, Heterosigma, Water temperature, Salinity, Japan, Hakata Bay.

Red tide consisting of two peaks took place in the Hakozaki fishing port, Hakata Bay, between late May and early June, 1973. A predominant organism was identified temporarily as Heterosigma sp., genus Heterosigma Hada, Dinoflagellida. The maximum cell density and chlorophyll-a concentration recorded at the time of the red tide were 835,000,000 cells/liter and 1,628 micrograms chl-a/liter, respectively. The average chlorophyll-a concentration per one cell was about .00000246 micrograms and growth rate (k'/day) of the red tide was calculated as 0.405. Although non-motile cells, non-flagella and global, were observed during early growth phase of the red tide, it could not be confirmed whether the non-motile cells were a form of early stage of Heterosigma sp. or not. (Katz-EIS)
W79-10317

THE TOXICITY OF A PRESUMPTIVE STEEL WORKS EFFLUENT FORMULATION,
University of Strathclyde, Glasgow (Scotland). Dept. of Biology.
O. J. Abbott, and E. J. Perkins.
Marine Pollution Bulletin, Vol. 10, p 176-177, 1979. 1 fig, 1 tab, 6 ref.

Descriptors: Bioassay, *Toxicity, Sulfur, Waste treatment, Steel, *Steel mill effluents, Industrial wastes, *Shrimps, *Crabs, Starfish, Sea urchins, Sulfides, England.

The toxicity of a steel works effluent to typical marine macro invertebrates was determined by bioassay. The 'Stretford Process' effluent which removes sulfur from the coke oven gas is less toxic to marine life than effluents with a higher sulfur content. (Katz-EIS)
W79-10319

5B. Sources Of Pollution

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME I, FEBRUARY 28-MARCH 3, 1977.
For primary bibliographic entry see Field 2A.
W79-10084

DRAINAGE BASIN RESEARCH IN EASTERN NORTH AMERICA,
National Science Foundation, Washington, DC. Div. of Advanced Environmental Research and Technology.
For primary bibliographic entry see Field 2E.
W79-10085

LAKE JACKSON WATERSHED STUDY: DESCRIPTION OF SITES, METHODOLOGY AND SCOPE OF RESEARCH,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10087

AN OVERVIEW OF THE CHOWAN RIVER RURAL RUNOFF STUDY,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W79-10088

WATERSHED RESEARCH IN NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-10089

THE MAHANTANGO CREEK WATERSHED--AN INTERDISCIPLINARY WATERSHED RESEARCH PROGRAM IN PENNSYLVANIA,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W79-10090

AN OVERVIEW OF THE RHODE RIVER WATERSHED PROGRAM,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2A.
W79-10091

NUTRIENT LOADING OF THE RHODE RIVER WATERSHED VIA LAND USE PRACTICE AND PRECIPITATION,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
J. Miklas, T-L. Wu, A. Hiatt, and D. L. Correll.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 169-193, 1977. 2 fig, 5 tab, 4 ref. EPA R804536-01.

Descriptors: *Nutrients, *Watersheds(Basins), *Precipitation(Atmospheric), *Land use, Water pollution, Water pollution sources, Chemistry of precipitation, Fertilizers, Feed lots, Farm wastes, Pastures, Nitrogen, Nitrates, Phosphorus, Potassium, Calcium, Magnesium, Sampling, Chemical analysis, Pollutants, Path of pollutants, *Rhode River Watershed(MD).

Nutrient loadings due to land use practices and precipitation were estimated for 983 ha of Rhode River watershed for 1976 both by land use categories and for 8 basins. Row crops and pasture occupied 38% of the area. Nitrogen loading averaged 24.9 Kg/ha-year from land use practices and 11.5 from precipitation for a total of 36.4. The nitrogen loading due to land use varied from 8.5 Kg/ha-year for basin 103 to 90.3 for basin 109. Loading of nitrogen due to various land uses varied from 7.6 Kg/ha-year for hayfields to 89.2 for corn to 4,490 for hog lots. The nitrogen in precipitation was predominantly in wet fall and about half was present as nitrate. The total yearly load of nitrate increased by 42% from 1974 to 1976. Phosphorus loading due to land use averaged 7.6 Kg P/ha-year and from precipitation was 0.75 for a total of 8.35. Phosphorus loading due to land use varied from 2.4 Kg/ha-year for basin 103 to 25.2 for basin 109. Loadings of phosphorus due to land use varied from 3.3 Kg/ha-year for hayfields to 65.7 for tobacco to 894 for hog lots. The phosphorus in precipitation was primarily dry fall. Potassium loading due to land use practices averaged 69.7 Kg/ha-year, and precipitation yielded 2.9 for a total of 72.6. Loading of potassium due to land use varied from 7.5 Kg/ha-year for basin 103 to 48.8 for basin 109 and from 6.9 Kg/ha-year for hayfields to 188 for tobacco to 876 for hog lots. Loading with calcium due to land use averaged 173 Kg/ha-year, while precipitation gave 9.7 for a total of 183. The calcium loading due to land use varied from 19.8 Kg/ha-year for basin 103 to 261 for basin 109 and from 53 Kg/ha-year for pasture to 218 for corn to 971 for tobacco to 1330 for feed lots. Loading of magnesium due to land use practices averaged 19.5 Kg/ha-year and from precipitation was 3.3 for a total of 22.8. Loading of magnesium due to land use varied from 0.4 Kg/ha-year for basin 105 to 143 for basin 109 and from 6.7 Kg/ha-year for residential plus roads to 38.8 for hayfields to 87.6 for corn to 356 for feed lots. Overall, the weight ratio of nitrogen to phosphorus inputs was 3.26. (See also W79-10084) (Sims-ISWS)
W79-10094

NUTRIENT DISCHARGE FROM WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
G. S. Henderson, A. Hunley, and W. Selvidge.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 307-322, 1977. 3 fig, 4 tab, 12 ref.

Descriptors: *Nutrients, *Watersheds(Basins), *Discharge(Water), Forest watersheds, Drainage, Chemicals, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sodium, Sulfur, Precipitation(Atmospheric), Rainfall, Runoff, Storm runoff, Fallout, Pollutants, Path of pollutants, Water pollution, *Walker Branch Watershed(TN).

Streamflow discharge of nutrient elements (N, P, K, Ca, Mg, Na and S) has been studied on Walker Branch Watershed for up to six years. Annual discharges of N, P and S are less than atmospheric inputs, whereas Ca, Mg, K and Na discharges exceed these inputs. Seasonal nutrient discharges are dependent on water yield. Concentration behavior of nutrients during storms has been used to identify processes within the watershed influencing nutrient release from the catchment. During storms, three patterns of concentration behavior were observed: dilution of concentration during stormflow (Ca and Mg); concentration increases during storms (N and S); and little change in concentration (dissolved K, P, Na) except for some concentration increase during autumn storms. These different patterns are caused by processes such as bedrock weathering, canopy and litter leaching, and expansion into variable source areas. Stormflow discharge is especially important in the transport of nitrogen and other elements primarily incorporated in organic matter. (See also W79-10084) (Sims-ISWS)
W79-10100

NUTRIENT EXPORT FROM THREE NORTH FLORIDA WATERSHEDS IN CONTRASTING LAND USE,
Michigan State Univ., East Lansing. Inst. of Water Research.
T. M. Burton, R. R. Turner, and R. C. Harriss.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 323-342, 1977. 2 fig, 10 tab, 29 ref.

Descriptors: *Nutrients, *Watersheds(Basins), *Land use, *Florida, Rainfall, Runoff, Fallout, Urban runoff, Storm runoff, Forest watersheds, Chemicals, Chlorides, Silicon, Nitrogen, Phosphorus, Urbanization, Temporal distribution, Hydrographs, Water pollution, Pollutants, Path of pollutants.

Exports of nutrients from a forested-agricultural, a suburban, and an urban watershed in north Florida were measured from 1973 to 1975. The most significant impact of urbanization was the change in temporal distribution and quantity of total and dissolved P exports. The urban watershed exported 16 times more total P than does the forested-agricultural watershed with the suburban watershed intermediate. Further, 98% of this total P was exported in quickflow (stormflow) on the urban watershed, while only 53% was exported in quickflow on the forested-agricultural watershed. Dissolved P exports were relatively low from all 3 watersheds with the primary effect of urbanization being the temporal changes in export, with 77% of the urban exports being in quickflow compared to 35% for the forested-agricultural watershed. Exports of inorganic N were highest from the suburban watershed, probably as a consequence of septic tank drainage; exports of NO3-N were 6 times higher for the suburban and 3 times higher for the urban, sewered watershed compared to the forested-agricultural watershed. Si and Cl were also monitored. Mechanisms controlling export of P, N, Cl, and Si were emphasized. (See also W79-10084) (Sims-ISWS)
W79-10101

NUTRIENT YIELD ASSESSMENT BY DIFFERENT SAMPLING STRATEGIES,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash, L. Bliven, F. Koehler, J. W. Gilliam, and F. J. Humenik.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 365-383, 1977. 4 fig, 8 tab, 1 ref. EPA R803328.

Descriptors: *Nutrients, *Sampling, *Watersheds(Basins), *Land use, Runoff, Streamflow, Chemicals, Water chemistry, Chemical oxygen demand, Oxygen, Phosphorus, Phosphates, Nitrogen, Nitrogen compounds, Pollutants, Path of pollutants, Water pollution, *Chowan River Basin(NC-VA).

A land use classification of 15 Chowan River subbasins representing 4 major soil-topographic regions was presented. A chemical concentration summary based on grab sample data was presented for the 4 regions. Regional as well as in-stream variations of the mean chemical concentrations were explored. The grab sample data were employed to demonstrate the differences in time average and volume average concentrations of total nitrogen and total phosphate for the 15 subbasins. Results of linear regressions between both total nitrogen and total phosphate yields and the dominant land use in the 15 subbasins were presented. (See also W79-10084) (Sims-ISWS)
W79-10102

SOIL WATER AND CHEMICAL MOVEMENT IN A SLOPING FRAGIPAN SYSTEM,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2G.
W79-10103

THE MAHANTANGO CREEK WATERSHED--SOURCE AND REACTION OF PHOSPHATE DURING STORM HYDROGRAPHS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
W. R. Heald, and W. J. Gburek.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 401-411, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Phosphates, *Path of pollutants, *Watersheds(Basins), *Hydrographs, Streamflow, Water pollution, Water pollution sources, Phosphorus, Phosphorus compounds, Nutrients, Runoff, Storm runoff, Sediments, Adsorption, Waste dilution, Mixing, Farm wastes, On-site investigations, Sampling, Hydrology, *Mahantango Creek Watershed(PA).

Measured spatial and temporal variations of phosphate concentrations during storm hydrographs were presented. The variations observed support the concept that the hydrologic and chemical contributing areas are similar and indicate the important phosphate reactions during storm flows. This investigation was conducted on the 420-sq-km Mahantango Watershed. Specific watershed characteristics relevant to this study are: soils are slightly acid; conservation practices recommended by the Soil Conservation Service are generally followed, resulting in little erosion from the fields; and most stream banks have a sod-forest plant cover. Data were collected only during the summer months because the low-flow conditions existing then make the storm hydrographs more distinct and shorter than the flow conditions during winter. The net effect of the 2 processes is as follows: During the initial rise of the storm hydrograph, there is a corresponding rise in (PO4-P). However, as the hydrograph moves downstream, (PO4-P) is continuously reduced by dilution and adsorption, even with continuous P inputs all along the stream. As precipitation diminishes, direct runoff decreases, thereby decreasing the dilution effect. However, phosphate input also decreases and the adsorption reaction continues to reduce soluble phosphate levels towards the equilibrium level that the sediment can support. (See also W79-10084) (Sims-ISWS)
W79-10104

NUTRIENT DISCHARGE FROM RHODE RIVER WATERSHEDS AND THEIR RELATIONSHIP TO LAND USE PATTERNS,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
D. L. Correll, T-L. Wu, E. S. Friebele, and J. Miklas.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume I, February 28-March 3, 1977. Report No. NSF/RA-770254. Smithsonian Institution, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 413-437, 1977. 3 fig, 7 tab, 14 ref. EPA R804536-01.

Descriptors: *Nutrients, *Runoff, *Watersheds(Basins), *Land use, Sampling, Water chemistry, Chemicals, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Streamflow, Base flow, Agriculture, Water pollution, Water pollution sources, Path of pollutants, Storms, Storm runoff, *Rhode River Watershed(MD).

Of the 983 ha of Rhode River watershed studied in 1975-76, 38% was used for row crops and pastureland. Annual nutrient area yield as runoff varied by about a factor of 3 between basins for most of these elements, and variation was much greater for seasonal area yields. Nutrient discharges varied about as much between years for a given basin as between basins for a given year. The storm behavior of basin 101 was much different from that of a nearby basin of similar size. This basin (103) normally only discharges half as much phosphorus per hectare-year as basin 101, and in this storm discharged 60 g P/ha in storm flow, which was only 23% of the total phosphorus discharged for the 6 month period. The only major characteristic which seemed different in these two basins was land use. Basin 101 (high storm discharge) had 9.6% cultivated land, 27.2% pasture plus hayfield, and 6% residential plus roads. Basin 103 had only 2.0% cultivated, 16.5% pasture, and 4.6% residential plus roads. Using 1975 runoff yields from 7 basins, average area yield loading factors for each nutrient were calculated with a statistical model for 3 land use classes: cultivated, pasture, and forest. These were highest for pasture for all elements but potassium, second highest for cultivated land, and very low for forest. (Area yields from pasture and cultivated lands were nearly equal for potassium). (See also W79-10084) (Sims-ISWS)
W79-10105

PATTERNS OF ORGANIC MATTER TRANSPORT ON WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
W79-10106

WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME II, FEBRUARY 28-MARCH 3, 1977.
For primary bibliographic entry see Field 2A.
W79-10107

LARGE PARTICULATE ORGANIC MATTER PROCESSING IN STREAM ECOSYSTEMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 2A.
W79-10109

BASELINE LEVELS AND SEASONAL VARIATIONS OF ENTERIC BACTERIA IN OLIGOTROPHIC STREAMS,
Georgia Univ., Athens. Inst. of Ecology.
M. R. McSwain.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 555-574, 1977. 9 fig, 3 tab, 12 ref. NSF DEB-77-5324.

Descriptors: *Oligotrophy, *Forest watersheds, *North Carolina, *Enteric bacteria, Streams, Mountains, Coliforms, Bacteria, Water sampling, On-site investigations, Streptococcus, Small watersheds, Demonstration watersheds, Water quality, Seasonal, Water temperature, On-site data collections.

In mountain streams at the Coweeta Hydrologic Laboratory, Franklin, North Carolina, naturally

occurring populations of enteric bacteria fluctuated seasonally and diurnally. Measurements of enteric bacteria were correlated with stream turbidities and stream temperatures. Data suggested that seasonal cycles were caused by multiplication of enteric bacteria in bottom sediments and that multiplication was regulated by stream temperatures. However, fecal streptococci were less responsive to changes in turbidity than were coliforms. Elevated levels of total and fecal coliforms during storms appeared more related to bottom sediment disturbances than to streambank flushing. In contrast, increases in fecal streptococcus counts during storms appeared more related to the washing of overhanging stream vegetation and streambank flushing. Diurnal cycling of enteric bacteria during baseflow periods was inversely related to diurnal cycles of streamflow. The results from this study in western North Carolina suggested that the response of enteric bacteria to selected physical parameters is somewhat site-specific because of differences in soil type, degree of stream channel cover, and climatic factors. (See also W79-10107) (Humphreys-ISWS)
W79-10111

THE ROLE OF NITRIFICATION IN NUTRIENT CYCLING OF FORESTED ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Agronomy.
N. A. Phillips, R. Rower, and R. L. Todd.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 579-590, 1977. 4 tab, 12 ref.

Descriptors: *Forest watersheds, *Cycling nutrients, *Reviews, *Ecosystems, Nutrients, Nitrification, Nitrogen, Water quality, Forest management.

In this review, nitrate-nitrogen levels in streamflow were compared for a number of manipulated forested watersheds. The microbial mediated conversion of ammonium-nitrogen to nitrate-nitrogen (nitrification) was discussed as it relates to nitrate-nitrogen content in runoff water. Hypotheses for system control of the nitrification process were reviewed. Studies of nutrient cycling in forested watersheds indicate that nitrate-nitrogen losses in stream flow is an indicator of system perturbation. This elevated level of nitrate-nitrogen was proposed to result from the action of terrestrial nitrifying bacterial activity. Climax forest ecosystems were proposed to have evolved means to control nitrification thereby preventing nitrate-nitrogen losses. As the need for forestry management increases, consideration must be given to be a better understanding of the nitrification process. (See also W79-10107) (Humphreys-ISWS)
W79-10112

ALGAL DIVERSITY AND TRANSPORT IN SMALL STREAMS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
D. W. Hayne, A. M. Witherspoon, and T. R. Fisher.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 593-607, 1977. 3 fig, 5 tab, 19 ref. EPA R803328.

Descriptors: *Algae, *Streams, *North Carolina, *Virginia, Biomass, Coastal plains, Water quality, On-site investigations, Water sampling, Analytical techniques, Analysis, Data collections, *Chowan River(NC), Algal diversity, Algal transport.

The Chowan River basin lies on the border of Virginia and North Carolina and drains east into Albemarle Sound. Data were presented from a one-year study of algal numbers, biomass, and diversity in two sub-basins of the Chowan, one a more rapidly flowing piedmont stream originating from well-drained soils, and the other a more sluggish coastal plain stream originating from poorly drained soils and swamps. The objective of the study was to explore the usefulness of algal abundance and diversity in the study of water quality and characterization of streams. (See also W79-10107) (Humphreys-ISWS)
W79-10113

BASIN SIZE, WATER FLOW AND LAND-USE EFFECTS ON FECAL COLIFORM POLLUTION FROM A RURAL WATERSHED,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
M. A. Faust, and N. M. Goff.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 611-632, 1977. 5 tab, 19 ref.

Descriptors: *Agricultural watersheds, *Water pollution sources, *Runoff, *Maryland, Land use, Water pollution, Analysis, Regression analysis, Bacteria, Water sampling, Watersheds(Basins), Coliforms, Discharge(Water), On-site investigations, Water quality, Forests, Pastures, Freshwater marshes, Crops, Cultivation, Agricultural runoff, Data collections, Livestock, *Rhode River(MD), Coliform discharge.

A comprehensive study was undertaken on the effects of a series of environmental variables on fecal coliform (FC) discharge from 983 ha of Rhode River (Maryland) watershed. Seven subwatershed basins, ranging in size from 28 to 254 ha, were instrumented to monitor water discharge rates. Of the monitored watershed area, 61% was forest and old field, 16% was cultivated cropland, 18% was pasture, while the remaining 5% was residential and freshwater wet areas. The average human and livestock densities of these basins are 0.31 person/ha and 0.53 livestock/ha. Water discharge estimated by weekly spot sampling of water flow was significantly correlated with weekly automated flow measurements (R sq = 0.992). Therefore, weekly spot sampling data were used to establish FC discharge from the basins. Water runoff was positively correlated with basin size (R sq = 0.973) and stream length (R sq = 0.922). Fecal coliform discharge was also positively correlated with water flow at all weirs at all seasons, with stream length (R sq = 0.799) and with basin size (R sq = 0.900). Fecal coliform discharge from three land uses was also estimated. From pasture the discharge was 89 x 10 to the 9th power FC ha/yr, from forest 22.4 x 10 to the 9th power FC ha/yr, and from cultivated land 19.8 x 10 to the 9th power FC ha/yr. From the entire study area, 68% of FC was discharged from pasture, 17% from forest, and 15% from cultivated land. (See also W79-10107) (Humphreys-ISWS)
W79-10114

SELECTED PATHOGENIC MICROORGANISMS CONTRIBUTED FROM URBAN WATERSHEDS,
Johns Hopkins Univ., Baltimore, MD. School of Hygiene and Public Health.
V. P. Olivieri, C. W. Kruse, K. Kawata, and J. E. Smith.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 635-659, 1977. 6 fig, 7 tab, 29 ref

Descriptors: *Water pollution sources, *Urban drainage, *Microorganisms, *Maryland, Storm runoff, Pathogenic bacteria, On-site investigations, Coliforms, Viruses, Water sampling, Storm water, Reservoirs, Water quality, Water pollution, Data collections, Streams, Urban watersheds.

Grab samples were collected from 3 urban streams, 6 storm drains, raw sewage, and an upland reservoir during a 13-month period in Baltimore City, Maryland. Each sample was assayed for levels of Salmonella sp., enteric viruses, Pseudomonas aeruginosa, Staphylococcus aureus and indicator bacteria (total coliform, fecal coliform, and fecal streptococci. Pathogenic microorganisms were consistently isolated from urban streams and storm runoff. The most numerous pathogens were P. aeruginosa and Staph. aureus at geometric mean densities of 290 to 6600/100 ml and 3 to 120/100 ml, respectively. Salmonella sp. and enteric viruses, though recovered at high frequencies, required concentration and were found at geometric mean densities of 5 to 140/101 and 7 to 280/101, respectively. Levels of indicator and pathogenic microorganisms were approximately 10-fold higher in the stormwater samples. Except for a slight elevation in the levels of P. aeruginosa in the fall, there appeared to be no marked seasonal variation in the levels of microorganisms. The density of fecal coliform appeared to be independent of instantaneous flow and the number of days since the last rainfall for both the urban stream and storm samples. The microbial quality of the urban streams and storm runoff was uniformly poor. Only 3 of 92 stream samples and 1 of 136 stormwater samples met the recommended 200 fecal coliform/100 ml standard. (See also W79-10107) (Humphreys-ISWS)
W79-10115

DYNAMICS OF TRACE ELEMENT EXPORT FROM A DECIDUOUS WATERSHED, WALKER BRANCH, TENNESSEE,
Oak Ridge National Lab., TN.
R. R. Turner, S. E. Lindberg, and K. Talbot.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 661-681, 1977. 3 fig, 6 tab, 29 ref.

Descriptors: *Trace elements, *Tennessee, *Metals, *Streamflow, *Watersheds(Basins), Sampling, Chemicals, Chemical analysis, Dissolved solids, Suspended solids, Carbon, Heavy metals, Cadmium, Copper, Chromium, Manganese, Lead, Zinc, Iron, Data processing, Correlation analysis, Pollutants, Path of pollutants, Water pollution, *Walker Branch Watershed(TN).

As part of an integrated study of trace contaminant behavior on a landscape scale, concentrations of several trace elements in both dissolved and particulate form were measured regularly in streamflow from Walker Branch Watershed during the period September 1975 to August 1976. In general, Cd, Cu, and Cr were transported primarily in dissolved form, with the relative fraction in particulate form increasing during storms. Iron and Mn, responding to the high pH (approximately 8.0) and oxygenated conditions of the stream, were transported primarily in particulate form. Dissolved Mn, and to a lesser extent dissolved Zn, generally increased in concentration as streamflow increased during storms, while dissolved Cr and dissolved Pb generally decreased. Dissolved levels of Cu, Mn, Zn, and Fe were correlated positively with dissolved organic carbon concentration, which frequently increased rapidly during early stormflow (i.e., indicating a flushing effect). Analysis of elements associated with stream particulate matter showed positive correlation between concentrations of several trace elements and Fe and Mn. The 12-month streamflow exports of Cd, Cr, Cu, Pb, Zn, Mn, and Fe were respectively 0.15, 0.49, 0.69, 2.22, 12.4, 193, and 316 grams/hectare. (See also W79-10107) (Sims-ISWS)
W79-10116

LAND UTILIZATION AND METALS DISCHARGE FROM THE RHODE RIVER WATERSHED,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
T. L. Wu, and M. T. Hoopes.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 683-706, 1977. 2 fig, 7 tab, 16 ref, 1 append.

Descriptors: *Metals, *Maryland, *Heavy metals, *Land use, *Streamflow, Watersheds(Basins), Sampling, Chemicals, Seasonal, Iron, Manganese,

Zinc, Chromium, Lead, Copper, Cadmium, Pollutants, Path of pollutants, Water pollution, Data processing, *Rhode River Watershed(MD).

Volume-integrated samples from 7 subwatershed basins of the Rhode River during 1975 were analyzed weekly for their heavy metals content. The yearly metals discharge per hectare for iron, manganese, zinc, chromium, cadmium, copper, and lead were calculated, and were found to vary for each basin and each metal. Generally, metals discharge decreases in the order of Fe, Mn, Zn, Cr, Pb, Cu, and Cd. A statistical model was employed to calculate the area yield loading rates of these heavy metals for the 3 different categories of land utilization in the Rhode River watershed, pasture, forest, and cultivated fields, on a seasonal basis. During the summer of 1975, pasture has the highest loading rate for most metals, while cultivated land showed the highest loading rate during the fall season of 1975 for Fe, Mn, and Zn. The discharge of Cr, Fe, Zn, and Pb was found to increase on a seasonal basis from winter through summer and then to decrease in the fall, while the Mn and Cu discharge matched the water discharge, and Cd was found to have a reverse relationship to water discharge. In addition, analysis of suspended particles versus the metals concentration indicated that only Fe is transported primarily in particulate form. (See also W79-10107) (Sims-ISWS)
W79-10117

RUNOFF STUDIES OF THE AGRICULTURAL HERBICIDES ALACHLOR AND ATRAZINE FROM THE RHODE RIVER WATERSHED DURING THE 1976 GROWING SEASON,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
T. L. Wu, N. J. Mick, and B. M. Fox.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 707-726, 1977. 7 fig, 7 tab, 7 ref. EPA R804536-01.

Descriptors: *Herbicides, *Maryland, *Runoff, *Agricultural chemicals, Soils, Rainfall, Soil moisture, Soil temperature, Agricultural runoff, Sampling, Chemicals, Crops, Corn(Field), Pollutants, Path of pollutants, Water pollution, Water pollution sources, Agriculture, *Rhode River Watershed(MD), Alachlor, Atrazine.

During the growing season of 1976, an intensive monitoring program of a small basin of the Rhode River watershed was carried out. A corn field of 16.4 hectares was treated with alachlor and atrazine. Concentrations of these herbicides in the soil profile and in runoff water from the corn field were determined. The runoff study was made possible by construction of two V-notched weir monitoring stations, one located immediately at the bottom of the drainage furrow of the corn field, the other one located down stream from this channel. Major concentrations of alachlor were found to remain on and above about 5 cm of soil profile. The residual alachlor was greatly reduced after 15 days of its application in the field. The residual atrazine showed a different pattern in its movement in soil. Detectable concentrations of atrazine were found in the deeper soil profile (24-30cm) 109 and 148 days after the atrazine application in the field. Atrazine and alachlor concentrations were determined in the runoff water during the 1976 growing season. Both particulate and dissolved phases were studied. Although enrichment of both atrazine and alachlor in the runoff particulates was detected, the transport of atrazine and alachlor in the dissolved phase of runoff water was often substantial. The detected runoff loss of atrazine for the corn field studied was calculated to be 1.2%; the runoff loss of alachlor was only 0.02%. (See also W79-10107) (Sims-ISWS)
W79-10118

SAMPLING METHODOLOGIES FOR ASSESSING RURAL RUNOFF,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W79-10121

A LINEAR APPROACH TO THE CALCULATION OF AREA YIELD COEFFICIENTS BASED ON LAND USE,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
G. R. Chirlin, and D. L. Correll.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 831-859, 1977. 2 fig, 3 tab, 9 ref, 1 append. EPA R804536-01.

Descriptors: *Water pollution sources, *Land use, *Model studies, Mathematical models, Equations, Runoff, Pollutants, Phoshorus, Chemicals, Rainfall, Precipitation(Atmospheric), Streams, Rivers, Watersheds(Basins), Water quality, *Rhode River Watershed(MD).

A model was presented which expresses waterborne mass flux out of a basin as a linear combination of the areas within the basin in each of several land use classes. The model structure may be formally derived from two distinct sets of assumptions, the less involved of which is simply a weighted least squares formulation. The weights were chosen equal to the inverse of estimated variances for the basin mass flux values. An example applied to total phosphorus export from 7 basins in 3 land uses in summer 1975 yielded the following loading coefficients: row crops export=522, pasture export=620, and forest export=106 g-P/ha/season. Sensitivity of this solution to the weighting scheme and the measured loadings was explored for 3 contrasting basins. General classes of behavior: 'underloading', 'overloading', and 'well-predicted loading' emerged during the analysis, suggesting directions of further inquiry in the analysis of the basin loading data. (See also W79-10107) (Sims-ISWS)
W79-10123

MODELING SEDIMENT TRANSPORT IN NATURAL CHANNELS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 2J.
W79-10124

APPLICATIONS OF A MARYLAND VERSION OF USDAHL-74 TO A WATERSHED IN PRINCE GEORGE'S COUNTY, MARYLAND,
Maryland Univ., College Park.
For primary bibliographic entry see Field 2A.
W79-10125

AGRICULTURALLY RELATED WATER QUALITY PROBLEMS IN RAPID CREEK,
South Dakota School of Mines and Technology, Rapid City.
L. L. Harms.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 819, Price codes: A04 in paper copy, A01 in microfiche. Completion Report prepared for the South Dakota Water Resources Research Institute, Brookings, June 1979. 55 p, 7 fig, 33 tab, 9 ref, 2 append. OWRT A-067-SDAK (1).

Descriptors: *South Dakota, *Waste water treatment, *Water pollution effects, Water analysis, Water sampling, Irrigation, Agriculture, Alfalfa, Stock water, Livestock, Conductivity, Water properties, Alkalinity, Degradation(Stream), Salts, Ammonia, Phosphorus.

Water samples from a portion of Rapid Creek downstream from the Rapid City, South Dakota, municipal waste-water treatment facility were collected and analyzed due to reported user problems. A subjective field survey of users below the treatment facility revealed that 69% thought that the water was unsuitable for livestock use and 25% felt that use of the water for irrigation caused abnormal retarded alfalfa growth. Grab samples were taken once or twice monthly in 1978 from February to May. From May to mid-September, the irrigation season, samples were taken weekly. During the sampling period precipitation and streamflow were near normal. Water quality data collected included pH, temperature, specific condition, chloride content, suspended solids, volatile suspended solids, total hardness, total residue, total phosphorus, sodium adsorption ratio, alkalinity, and various other mineral content levels. Results show that water quality does decrease as it progresses downstream and the wastewater treatment facility is responsible for some of the degradation. Major problem areas were specific conductance, total salts, chloride, ammonia, nitrates, sodium, and phosphorus. However, the levels involved in these problem areas were not significant enough to cause the reported livestock and irrigation problems. (Seigler-IPA)
W79-10158

METHODS OF ULTIMATE CARBONACEOUS BOD DETERMINATION,
Geological Survey, Doraville, GA. Water Resources Div.; and Geological Survey, Portland, OR. Water Resources Div.
J. K. Stamer, S. W. McKenzie, R. N. Cherry, C. T. Scott, and S. L. Stamer.
Journal of the Water Pollution Control Federation, Vol. 51, No. 5, p 918-925, May 1979. 9 fig, 2 tab, 11 ref.

Descriptors: *Water quality, *Water pollution sources, *River basins, *Georgia, *Biochemical oxygen demand, Nitrification, Dissolved oxygen, Waste water(Pollution), Path of pollutants, Municipal wastes, Oxygen demand, *Upper Chattahoochee River basin, *Atlanta area(Ga), Chemical nitrifying inhibitors, Rates of carbonaceous oxygen.

The combined use of time-series biochemical oxygen demand analysis and Lee's graphical method provides a reliable technique for determining ultimate carbonaceous biochemical oxygen demand and the rate at which this demand is exerted. During the 5-to-7 day incubation period, measurements of dissolved-oxygen concentrations provide adequate definition of the amount and rate of carbonaceous biochemical oxygen demand. Comparable ultimate carbonaceous biochemical oxygen demand concentration and carbonaceous reaction rate can be determined from nonnitrified samples using no chemical nitrifying inhibitor and from partially nitrified samples using the chemical inhibitors, 1-allyl-2 thiourea or nitrapyrin. (Woodard-USGS)
W79-10180

GROUND WATER QUALITY DATA FROM A SLUDGE DISPOSAL TEST SITE, ST. PETERSBURG, FLORIDA, NOVEMBER 1973-JULY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
M. Fernandez, Jr.
Geological Survey open-file report 78-821, 1979. 101 p, 2 fig, 6 tab.

Descriptors: *Water quality, *Water analysis, *Groundwater, *Sludge disposal, *Observation wells, Well data, Path of pollutants, Anaerobic digestion, Chemical analysis, Metals, Trace elements, Nitrogen, Phosphorus, Coliforms, Biochemical oxygen demand, Chemical oxygen demand, Soil management, *St Petersburg(FL), Sod farm.

From November 1973 to July 1977, water samples were collected from wells to identify background water-quality conditions and to determine the effects on ground-water quality by St. Petersburg's sludge-disposal operation (sod farm). Specific conductance and pH were determined in the field. Samples were collected for laboratory determination of selected nitrogen and phosphorus species, sodium, potassium, calcium, magnesium, chloride, trace metals, chemical and biochemical oxygen demand, and coliforms. (Woodard-USGS)
W79-10182

WATER-QUALITY DATA FROM A LANDFILL, PINELLAS COUNTY, FLORIDA, MAY 1975-OCTOBER 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
M. Fernandez, Jr.
Geological Survey open-file report 78-822, 1979. 97 p, 2 fig, 8 tab.

Descriptors: *Baseline studies, *Landfills, *Waste disposal, *Water quality, *Groundwater, Path of pollutants, Observation wells, Well data, Data collections, Water analysis, Metals, Trace elements, Nitrogen, Coliforms, Herbicides, Pesticides, *Pinellas County(FL).

Beginning in May 1975, surface- and ground-water samples were collected periodically to obtain certain background water-quality conditions at a landfill site in Pinellas County, Florida. Landfill operation began in November 1975, and water analysis continued to October 1977. Specific conductance and pH were determined in the field. Samples were collected for laboratory determination of selected nitrogen and phosphorus species, sodium, potassium, calcium, magnesium, trace metals, chloride, pH, specific conductance, chemical and biochemical oxygen demands, specific pesticides, and herbicides and coliforms. The collected data are presented. (Woodard-USGS)
W79-10183

EFFECTS OF ORGANIC WASTE ON PRIMARY AND SECONDARY PRODUCTION IN THE EMS-DOLLARD ESTUARY,
Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5A.
W79-10192

MERCURY IN THE AQUATIC ECOSYSTEMS OF THE PROVINCE OF QUEBEC, CANADA (IN FRENCH),
Environmental Protection Service, Montreal (Quebec).
For primary bibliographic entry see Field 5A.
W79-10194

MERCURY AND SELENIUM CONTENT OF ODONTOCETI, (IN JAPANESE)
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
S. Arima, and K. Nagakura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 45, No. 5, p 623-626, 1979. 3 fig, 3 tab, 15 ref.

Descriptors: *Mercury, *Path of pollutants, Chemical analysis, Fish physiology, Animal metabolism, Growth stages, Mammals, Aquatic animals, Heavy metals, Size, *Selenium, *Tissue analysis, *Bioaccumulation, *Porpoise, *Dolphin, *Whale, *Seal.

Several species of Odontoceti from the coastal waters of Japan were analysed for total mercury and selenium content in the muscle. The highest mercury content, 51.8 ppm, was found in Gill's Bottle-nosed Dolphin (Tursops gilli). The lowest value, 0.16 ppm, was obtained in the foetus of Finless Black Porpoise (Neophocaena phocaenoides). The mean mercury contents were 4.63 ppm (0.95 9.43) in Blue White Dolphin (Stenella caeruleo-alba) and 4.16 ppm (3.01 5.18) in Pilot Whale (Globicephala melaena). These values are rather high compared with those of marine mammals such as seals and whales. The mercury content in muscle increases linearly along with the age of animals. A high correlation was obtained between mercury and selenium content in the muscles of all species investigated. The molar ratio of mercury to selenium was about 1.5, indicating an excess of mercury in muscles. (Deal-EIS)
W79-10196

HEAVY METAL CONCENTRATIONS AND PHYTOPLANKTON PRODUCTION, BIOMASS AND STRUCTURE IN A NORTHERN ESTUARINE AREA OF THE BALTIC SEA,
Salt and Water Ltd., Helsinki (Finland).
For primary bibliographic entry see Field 5A.
W79-10197

RATIO ATP/CHLOROPHYLL AS AN INDEX OF RIVERS' WATER QUALITY,
Istituto di Ricerca Sulle Acque, Rome (Italy).
For primary bibliographic entry see Field 5A.
W79-10198

MUDDY OFF-FLAVOUR IN BREAM (ABRAMIS BRAMA L.) FROM THE PORVOO AREA, GULF OF FINLAND,
Helsinki Univ. (Finland). Dept. of Limnology.
For primary bibliographic entry see Field 5A.
W79-10203

AMMONIFICATION PROCESSES IN FERTILIZED LAKES,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Hydrobiology and Water Conservation.
For primary bibliographic entry see Field 5A.
W79-10210

MERCURY CIRCULATION IN AQUATIC BIOCONESES. PART 1: MERCURY (II)-METABOLISM IN PHYTOPLANKTON,
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W79-10213

DETERMINATION OF TOTAL AMMONIA NITROGEN AND CHEMICAL OXYGEN DEMAND IN FISH CULTURE SYSTEMS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquaculture.
For primary bibliographic entry see Field 5A.
W79-10215

HEMATOLOGY AS INDEX OF SUBLETHAL TOXICITY OF ZINC IN A FRESHWATER TELEOST,
Gorakhpur Univ. (India). Dept. of Zoology.
S. Mishra, and A. K. Srivastava.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 695-698, 1979. 1 tab, 15 ref.

Descriptors: *Fish physiology, *Zinc, *Toxicity, Hematology, Sublethal toxicity, Metals, Teleost, Animal metabolism, Bioassay, Lethal limit, Chemical analysis, Biochemistry, Path of pollutants, Water chemistry, *Colisa.

Colisa fasciatus were exposed under laboratory conditions to zinc sulphate at sublethal concentrations (100 ppm) for 90 h. Each fish was then anesthetized and blood samples taken for analysis. Total red cell counts, hematocrits, total white cell counts, and the number of small lymphocytes/1000 cells decreased significantly, while erythrocyte sedimentation rate increased markedly from corresponding control values. The hemoglobin content, clotting time, and total and differential thrombocyte counts remained well within limits observed in controls. Significantly higher hepatosomatic index was recorded for zinc-treated fish as compared with unexposed animals. (Deal-EIS)
W79-10218

ORGANOCHLORINE RESIDUES IN RAPTOR EGGS IN THE CAYUGA LAKE BASIN,
National Wildlife Federation, Washington, DC.
J. L. Lincer, and R. J. Clark.
New York Fish and Game Journal, Vol. 25, No. 2, p 121-128, 1978. 2 tab, 33 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Bird eggs, *Pesticide toxicity, *Pesticide residues, DDE, Dieldrin, Polychlorinated biphenyls, New York, Heptachlor, Chemical analysis, Chromatography, Marsh birds, *Raptors, *Hawks, *Buteos, *Owls, *Kestrels, *Bioaccumulation, *Tissue analysis.

Organochlorine residue burdens and eggshell thinning in the eggs of hawks and owls nesting in the Canyon Lake Basin in central New York were compared. Except for those of the buteos (red-tailed hawk, red-shouldered hawk and broad-winged hawk), all the eggs examined contained high, but variable, DDE levels. Values in eggs of the red-tailed hawk ranged from approximately 2 to 14 ppm, and those for other buteos fell within this span. Eggs of the screech owl, American kestrel and Cooper's hawk contained intermediate mean residue levels (12 to 67 ppm). The highest mean DDE level and the highest DDE level in an individual egg were exhibited by the great horned owl (102 and 248, respectively). Limited data on residues are also presented for dieldrin, heptachlor epoxide and PCB's. Data on eggshell thinning indicated that there had been little decrease in shell thickness for eggs of the buteos, while for eggs of the great horned owl and American kestrel shell thickness had decreased about 10 per cent. The Cooper's hawk exhibited the greatest increase in the degree of eggshell thinning (10 per cent), and its situation may be critical. The ecological factors responsible for residue differences between hawk-owl counterparts, as well as needed research, are discussed. (Deal-EIS)
W79-10220

BIOASSAY OF BALTIMORE HARBOR SEDIMENTS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5A.
W79-10227

THE DETECTION OF MUTAGENIC CHEMICALS IN THE TISSUE OF THE MUSSEL MYTILUS EDULIS,
University Coll. of Swansea (Wales). Dept. of Genetics.
For primary bibliographic entry see Field 5A.
W79-10228

TILE FLOW RESPONSE IN A LAYERED SOIL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W79-10248

PREDICTION OF POLLUTANT RELEASE RESULTING FROM DREDGING,
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-10256

CARBON ISOTOPE RATIOS OF PARTICULATE ORGANIC MATTER IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2L.
W79-10258

CHANGES IN THE AMOUNT OF ORGANOCHLORINE PESTICIDES IN MACROINVERTEBRATE COMMUNITIES OF THE VAL PARMA RUNNING WATERS (ITALY),
Parma Univ. (Italy). Lab. di Ecologia.
For primary bibliographic entry see Field 5A.
W79-10270

EFFECTS OF EFFLUENTS FROM A VARIETY OF SEWAGE TREATMENT METHODS ON PRIMARY PRODUCTIVITY, RESPIRATION AND ALGAL COMMUNITIES IN ARTIFICIAL STREAM CHANNELS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-10271

SUCCESSION OF PHYTO- AND ZOOPLANKTON IN A WASTEWATER STORAGE RESERVOIR,
Mekorot Water Co., Tel Aviv (Israel).
For primary bibliographic entry see Field 5A.
W79-10272

PONTOPOREIA DISTRIBUTION ALONG THE KEWEENAW SHORE OF LAKE SUPERIOR AFFECTED BY COPPER TAILINGS),
Michigan Technological Univ., Houghton, MI. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W79-10274

PHYTOPLANKTON POPULATION DYNAMICS AND PRODUCTIVITY IN A SEWAGE-ENRICHED TIDAL CREEK IN NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-10275

SEXUAL MATURATION AS A SOURCE OF VARIATION IN THE RELATIONSHIP BETWEEN CADMIUM CONCENTRATION AND BODY WEIGHT OF MYTILUS EDULIS L.,
Institut National de la Recherche Scientifique, Rimouski (Quebec). Lab. Oceanographique.
For primary bibliographic entry see Field 5A.
W79-10278

HYDROBIOLOGICAL AND CHEMICAL RESPONSE TO THE ADDITION OF IRON AND ALUMINUM SALTS, STUDIED IN THREE LUND-TYPE BUTYLRUBBER RESERVOIRS,
Koudekerk a/d Rijn (The Netherlands).
For primary bibliographic entry see Field 5A.
W79-10280

DEVELOPMENT OF PLANKTONIC ALGAE IN THE RUHR RIVER DEPENDENT ON NUTRIENT SUPPLY, WATERFLOW, IRRADIANCE AND TEMPERATURE,
Ruhr River Association, Essen (Germany, F.R.). Chemical and Biological Lab.
For primary bibliographic entry see Field 5A.
W79-10284

AN ATTEMPTED POLLUTION ABATEMENT IN THE GULF OF LA NAPOULE (CANNES, FRANCE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
G. L. Bellan.
Marine Pollution Bulletin, Vol. 10, p 166-169, 1979. 2 fig, 1 tab, 9 ref.

Descriptors: Water pollution effects, *Domestic wastes, *Benthos, Waste disposal, Effluents, *Effluent pipeline, Mediterranean, Gulf of La Napoule, *Animal groupings, Path of pollutants, Water pollution sources, Indicator organisms, Waste water disposal, Scolelepis, Capitella.

A benthic survey was carried out in 1973 at the servicing of a 1285 m long submarine pipe designed to achieve pollution abatement in the Gulf of La Napoule (Cannes, French Mediterranean coast) and repeated 4 years later (1977). This last survey points to a good recovery of benthic communities in the eastern part of the Gulf (off Cannes) but a severe change in the western part of the Gulf with the appearance, in a deposition area, of the species Scolelepis fuliginosa and Capitella capitata which are highly characteristic of polluted areas and which had not been sampled during the first survey. The biological survey indicated that the disposal line did not work as anticipated. It was obvious that the hydrodynamic studies were inadequate and the submarine pipe was too short. (Katz-EIS)
W79-10288

EFFECTS OF SELFPURIFICATION AND THE BENTHIC ORGANIC LOAD ALONG A STREAM POLLUTED BY A PIGGERY, (IN FRENCH),
Centre Universitaire de Chambery (France).
For primary bibliographic entry see Field 5A.
W79-10290

MINERAL AND PURINIC BIOACCUMULATION IN AQUATIC INSECTS,
Laboratoire d'Histophysiologie des Insetes Paris (France).
For primary bibliographic entry see Field 5A.
W79-10292

EFFECTS OF THERMAL DISCHARGE ON LEAF DECOMPOSITION IN A RIVER ECOSYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
R. W. Paul, Jr., E. F. Benfield, and J. Cairns, Jr.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1759-1766, 1978. 3 fig, 1 tab, 20 ref.

Descriptors: *Food chain, *Degradation(Decomposition), Environmental effects, *Thermal power plant, Water pollution effects, Water temperature, Organic matter, *Leaf decomposition, New River, Glen Lyn, Virginia, On-site-investigation, Leaf decay, Lignin, Cellulose, Hemicellulose.

The degradation of leaf material in the New River in the vicinity of a fossil fuel electric generating plant at Glen Lyn, Virginia was studied. The effects of the heated discharge on leaf pack degradation appeared to be stimulating resulting in degradation rates that were significantly higher in the heated portion of the stream. Authors postulate a profound effect on the detrital food web in the heated areas of the stream. The impact of this on the total system was not determined. (Katz-EIS)
W79-10295

EFFECT OF AGE, WEIGHT, AND SEX ON THE MERCURY CONTENT IN THE MUSCLES AND SELECTED ORGANS OF NORTHERN PIKE (ESOX LUCIUS L.), (IN POLISH),
Instytut Technologii zym Zywnosci Pochodzenia Morskiego, Szczecin (Poland).
For primary bibliographic entry see Field 5A.
W79-10299

CONCENTRATIONS OF PCBS, BHCS AND DDTS RESIDUES IN SEAWEEDS OF THE EAST COAST OF SICILY,
Catania Univ. (Italy). Inst. di Chimica e Chimica Industriale.
For primary bibliographic entry see Field 5A.
W79-10301

SOME PRELIMINARY DATA ON NUTRIENTS AND CHLOROPHYLL IN ORGANICALLY POLLUTED RIVERS (GRANADA/SOUTH SPAIN),
Granada Univ. (Spain). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10303

INFLUENCE OF THE FISHSTOCK ON THE PHOSPHORUS-CHLOROPHYLL RATIO,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5A.
W79-10305

CHANGES OF PHYTOPLANKTON COMPOSITION AND ITS CHARACTERISTICS DURING RED TIDE SEASON, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan). Water Quality Div.
For primary bibliographic entry see Field 5A.
W79-10306

CHANGES IN DDT, DDE AND DDD CONTENTS DURING PRODUCTION OF CANNED HERRING (THE 'GDANSK HERRING'), (IN POLISH),
Instytut Technologii zym Zyrnosci Pochodzenia Morskiego, Szczecin (Poland). Zaklad Higieny Przemyslu Rybengo.
For primary bibliographic entry see Field 5A.
W79-10308

EXPERIMENTAL REARING OF RAINBOW TROUT (SALMO GAIRDNERI RICH.) IN COOLING WATERS OF 'DOLNA ODRA' POWER STATION),
Institute of Marine Biological Resources Exploitation and Protection, Szcecin (Poland).
For primary bibliographic entry see Field 5A.
W79-10310

CONCENTRATION FACTORS OF THE ELEMENTS COBALT, MANGANESE, IRON, ZINC AND SILVER FOR FISH,
Bundesforschunganstalt fuer Fisherei, Hamburg (Germany, F.R.). Istopenlaboratorium.
For primary bibliographic entry see Field 5A.
W79-10311

PHYSICAL AND CHEMICAL FACTORS AFFECTING FISH DISTRIBUTION IN LAKE MANZALAH-EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5A.
W79-10316

A RED TIDE OCCURRED AT THE HAKOZAKI FISHING PORT, HAKATA BAY, IN 1973. THE GROWTH PROCESS AND THE CHLOROPHYLL CONTENT,
Tokai Regional Fisheries Research Lab., Tokyo (Japan). Water Quality Div.
For primary bibliographic entry see Field 5A.
W79-10317

STREPTOMYCES SP: A SOURCE OF ODOROUS SUBSTANCES IN POTABLE WATER,
Auburn Univ., AL. Dept. of Botany and Microbiology.
J. D. Weete, W. Y. Huang, and J. L. Laseter.
Water, Air and Soil Pollution, Vol. 11, p 217-223, 1979. 1 fig, 1 tab, 39 ref. OWRT A-057-ALA(1). 14-34-0001-7001.

Descriptors: *Chromatography, *Mass spectrometry, Contaminants, *Steptomyces, Butyric acid.

Growth medium containing an aquatic actinomycete Steptomyces sp. was analyzed by gas-liquid chromatography and mass spectrometry for the purpose of identifying substances that may represent potential odorous contaminants of water. Twenty-one odorous and nonodorous compounds were identified. Phenyl, C2 and C4 structures were predominant. Free fatty acids from C13 to C16 were detected and in some cases accompanied by their ethyl (C16) and butyl (C15 and C16) esters. The long-chain acids and esters had no detectable odor. Although geosmin, an earthy smelling substance with a low odor threshold, was detected, butyric acid was the principal metabolite under the growth condition employed and represented the greatest potential as an odorous water pollutant under natural conditions.
W79-10321

5C. Effects Of Pollution

THE ROLE OF NITRIFICATION IN NUTRIENT CYCLING OF FORESTED ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W79-10112

THE EVOLUTION OF WATER QUALITY MANAGEMENT, PART I,
R. D. Henningan.
Clearwaters, New York Water Pollution Control Association, Inc., Vol. 9, No. 2, p 12-14, June 1979. 1 tab, 1 ref.

Descriptors: *New York, *Water quality control, *Water management(Applied), Water pollution control, Diseases, Environmental sanitation, Sewage disposal, Public health, Epidemics, Human diseases, Sewers, Urbanization, History.

The history of water quality management in New York State for the past 100 years can be divided into seven periods: (1) Rural Laissez-faire, 1880-1902; (2) Public Health, 1903-1935; (3) Recognition - Transition, 1935-1949; (4) New Approaches, 1949-1962; (5) Demand for Change, 1962-1972; (6) Preservation and Conservation, 1972-1977; and (7) Balancing Interests, 1977-1982. The first three periods are discussed in detail. The Rural Laissez-faire period was characterized by great social and industrial change. Waterborne diseases such as typhoid, gastro-intestinal disease, and cholera were common and epidemic. The New York State board of health was established in 1880 followed by the State Department of Health in 1901. The basic policy that evolved was the prevention of diseases by water supply protection. The second period, Public Health, was characterized by a rapidly expanding economy during World War I and the 1920s and ended with the great depression. For New York, it was a major sewer building period. Much progress was made toward the elimination of waterborne diseases due to filtration and disinfection of water supplies. Polluted water sources were abandoned which represent a general policy of water resource abuse. The third period, Recognition-Transition, was a time of increasing concern about water quality management and the abandonment policies of the previous years. Many legislative proposals were made and interstate water pollution control agencies were created. The major concern was primary treatment for raw sewage while industrial wastes were virtually ignored. (Seigler-IPA)
W79-10155

ALASKA MINING AND WATER QUALITY, PROCEEDINGS, SYMPOSIUM HELD AT UNIVERSITY OF ALASKA, FARIBANKS, ARPIL 9, 1976.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 797. Price codes: A05 in paper copy, A01 in microfiche. Alaska University, Fairbanks, Institute of Water Resources. Report No. IWR 93, 87 p, April 1979. OWRT A-055-ALAS (1).

Descriptors: *Alaska, *Placer mining, *Water quality, Environmental effects, Water pollution control, Benthos, Gold, Industrial water, Economic impact, Mine water, Permafrost.

Differing viewpoints on controversial issues in Alaskan water resources and mining are presented in 12 papers. The issues covered fall into the major categories of government, industry, and research. Mining and water quality viewpoints are presented from the perspectives of the Federal Government and from the Alaska departments of Environmental Conservation, Fish and Game, and Natural Resources. Aspects of placer mining covered include water quality problems, the Northern Inland Waters Act, environmental controls, water uses, and cost/benefit considerations. Mining industries at Livengood and Nome are discussed. Research is reported in the area of environmental impact, pollution control, and stream water quality following placer mining. (Seigler-IPA)
W79-10157

THERMAL REGIMES OF THE MISSISSIPPI AND MISSOURI RIVERS DOWNSTREAM FROM THE SOUTHERN IOWA BORDER,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
A. R. Giaquinta, and T. T. C. Keng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 470. Price codes: A10 in paper copy, A01 in microfiche. IIHR Report No. 211, Iowa State Water Resources Research Institute Completion Report No. ISWRRI-92, January 1978. 198 p, 23 fig, 91 tab, 23 ref, 4 append. OWRT B-056-IA (1).

Descriptors: *Missouri River, *Mississippi River, *Mathematical models, *Water temperature, Thermal pollution, Water cooling, Powerplants, Thermal capacity, Heat budget, Hydroelectric plants, Nuclear powerplants, Water pollution sources, Environmental effects.

The steady-state version of the Iowa Thermal Regime Model was used to simulate existing thermal regimes and future thermal regimes resulting from powerplant installations on portions of the Mississippi and Missouri Rivers. The numerical model is presented along with a review of the basic equations used for energy conservation and heat transfer. Temperature distributions are given for existing powerplants and for future powerplants due for installation through 1995. Locations and capacities for future plants were determined within the bounds of existing thermal standards. Calculations were made for average meteorological and hydrological conditions for February, May, August, and November and for the extreme 7-day, 10-year low flow for August and November. Mississippi River results show that existing and future proposed powerplants would not exceed present thermal standards. Future acceptable plant capacity totals are 71,500 MW to 111,800 MW for open-cycle cooling fossil-fueled plants and 49,400 MW to 77,300 MG for nuclear plants. In the Kansas City area of the Missouri River, the river has no remaining additional heat assimilation capacity. Any new open-cycle cooling powerplant upstream from Kansas City would exceed heat standards downstream. Future capacities for other plants are 5980 MW to 12,400 MW for fossil-fueled plants and 4140 MW to 8570 MW for nuclear plants. (Seigler-IPA)
W79-10159

PHYSIOLOGICAL DYSFUNCTION OF THE HAEMOPOIETIC SYSTEM IN A FRESH WATER TELEOST, LABEO ROHITA, FOLLOWING CHRONIC CHLORDANE EXPOSURE. PART I - ALTERATIONS IN CERTAIN HAEMATOLOGICAL PARAMETERS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. K. Bansal, S. R. Verma, A. K. Gupta, and R. C. Dalela.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 666-673, 1979. 2 tab, 19 ref.

Descriptors: *Pesticide toxicity, *Fish physiology, Teleosts, Freshwater fish, Chlorinated hydrocarbon pesticides, Chemical analysis, Animal metabolism, Mode of action, Lethal limit, *Chlordane, *Hematology, *Tissue analysis.

In order to evaluate the sensitivity of the haemopoietic system to pesticides, Labeo rohita were exposed to 17, 23, 35 and 70 microgr/l chlordane for 30 or 60 days. A significant decrease in clotting time was observed at 35 and 70 microgr/L. An increase in hemoglobin was observed at all concentrations. Red blood cell counts increased all concentrations while white blood cell counts showed no significant changes. Hematocrit and erythrocyte sedimentation rates also exhibited no significant changes. If the toxicity index of chlordane is determined using these haematological data, the 'no effect' concentration is 17 microgro/L, or 1/12 of the TL50. (See also W79-10187) (Deal-EIS)
W79-10186

PHYSIOLOGICAL DYSFUNCTION OF THE HAEMOPOIETIC SYSTEM IN A FRESH WATER TELEOST, LABEO ROHITA, FOLLOWING CHRONIC CHLORDANE EXPOSURE. PART II-ALTERATIONS IN CERTAIN ORGANIC COMPONENTS AND SERUM ELECTROLYTES,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10187

EFFECTS OF TEMPERATURE ON DOMINANT MACROZOOBENTHOS SPECIES OF THE RIVER SAVA UNDER LABORATORY CONDITIONS,
Zagreb Univ. (Yugoslavia). Faculty of Natural Sciences and Mathematics.
For primary bibliographic entry see Field 5A.
W79-10188

INCREASED GROWTH IN MINNOWS EXPOSED TO PCBS,
National Swedish Environment Protection Board, Studsvik. Brackish Water Toxicology Lab.
B.-E. Bengtsson.
Ambio, Vol. 8, No. 4, p 169-170, 1979. 2 fig, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Toxicity, *Minnows, *Growth rates, Fish diets, Fish physiology, Weight, Animal metabolism, Path of pollutants, Chemical analysis, Gas chromatography, *Tissue analysis, *Bioaccumulation.

Minnows, Phoxinus phoxinus (L), were fed for 29 days with food containing four different concentrations of polychlorinated biphenyls (Clophen A50). The fish were weighed individually at the start and at the end of the experiment. All four groups of minnows exposed to increased levels of polychlorinated biphenyls had gained more in weight than the control group. It is suggested that this phenomenon results from a disturbance of the hormonal system and that the occurrence of stimulated growth is related to seasonal variations in the metabolic activity of the fish. (Deal-EIS)
W79-10190

ANALYSIS OF THE EFFECTS ON ALGAE AND THE MACROPHYTOBENTHONIC COMMUNITY OF THE UPPER PART OF THE INFRALITTORAL ZONE OF MARINE WASTE DISPOSAL VIA THE GRAND SEWER OF MARSEILLE, (IN FRENCH)
Station Biologique de Roscoff (France).
T. Belsher.
Tethys, Vol. 9, No. 1, p 1-16, 1979. 15 fig, 3 tab, 34 ref.

Descriptors: *Phytoplankton, *Biological communities, Sewage effluents, Littoral, Bioindicators, Marine algae, Phaeophyta, Rhodophyta, Dominant organisms, Benthos, Chlorophyta, Statistical analysis, *Species diversity, Mediterranean Sea, Marseille, France.

Modern phytosociological methods, similarity analysis, statistical tests, and 'inertia analysis' have been applied to 22 sites distributed along the shore on the mainland and on Riou, Jarre and Pomegues Islands. The methods have shown that there are clear 'discontinuities' in the 'macrophytobenthic' communities of the upper part of the infralittoral zone. Other remarkable results are concerned with the occurrence of a relatively dense seaweed community in the vicinity of the sewage outlet into the sea, the 'impoverishment' and general disequilibrium of algal communities, and the lowering of 'reproduction' in the maximum pollution zone. Some groups of species appear to be pollution indicators, either because they decrease in abundance (Phaeophyceae, Cryptonemiales, Ceramiales, Gigartinales) or else increase in abundance (Protoflorideae or Bangiophycideae). As a rule Rhodophyceae are dominant in the polluted area. (Deal-EIS)
W79-10191

EFFECTS OF ORGANIC WASTE ON PRIMARY AND SECONDARY PRODUCTION IN THE EMS-DOLLARD ESTUARY,
Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5A.
W79-10192

EFFECTS OF DDT ON BLOOD PLASMA ELECTROLYTES IN THE FLOUNDER, PLATICHTHYS FLESUS L, IN HYPOTONIC BRACKISH WATER,
Goteborg Univ. (Sweden). Dept. of Zoophysiology.
C. Haux, and A. Larsson.
Ambio, Vol. 8, No. 4, p 171-173, 1979. 2 fig, 1 tab, 19 ref.

Descriptors: *DDT, *Pesticide toxicity, *Electrolytes, Chlorinated hydrocarbon pesticides, Proteins, Chlorides, Magnesium, Ions, Fish physiology, Animal metabolism, Calcium, Phosphates, Potassium, Salinity, *Flounder, *Hematology, *Tissue analysis.

DDT, in sublethal dosages (1.5 and 15 mg/kg body weight), was orally administered to flounders kept

in slightly hypotonic brackish water. In order to study the effects of DDT on osmotic and ionic regulation, the osmolality, as well as the concentrations of various inorganic ions and total protein in blood plasma, were measured after three and six weeks. DDT caused significant decreases in chloride and magnesium concentrations, suggesting an impaired ability to maintain ion homeostasis. (Deal-EIS)
W79-10193

MERCURY IN THE AQUATIC ECOSYSTEMS OF THE PROVINCE OF QUEBEC, CANADA (IN FRENCH),
Environmental Protection Service, Montreal (Quebec).
For primary bibliographic entry see Field 5A.
W79-10194

THE EFFECTS OF OIL DISPERSANTS ON MARINE EGGS AND LARVAE,
Tromso Univ. (Norway). Inst. of Biology and Geology.
S. Lonning, and I.-B. Falk-Petersen.
Astarte, Vol. 11, p 135-138, 1978. 3 tab, 8 ref.

Descriptors: *Oil spills, *Toxicity, Oil, Oil pollution, Animal physiology, Fertility, Reproduction, Larval growth stage, Fish eggs, Crustaceans, Polychaetes, Bioassay, *Dispersants, *Sea urchins.

The effects of the oil dispersants Corexit 7664, 9527, 9600, BP 1100 X, 1100 WD, and Finasol OSR2, OSR5, and OSR7 were tested on eggs and larvae from sea urchins and marine fishes, on nauplii, and on some other plankton organisms. A comparison of the different dispersants shows that the concentrates Corexit 9527 and Finasol OSR5 and OSR7 produce most effects in all types of experiments. A comparison of various organisms and stages shows that the fertilization process of sea urchins and the early development of fish are particularly sensitive to oil dispersants. However, effects are obtained in all kinds of experiments, not only with larvae, but also with adult plankton organisms (medusae and copepods). (Deal-EIS)
W79-10195

MERCURY AND SELENIUM CONTENT OF ODONTOCETI, (IN JAPANESE)
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5B.
W79-10196

HEAVY METAL CONCENTRATIONS AND PHYTOPLANKTON PRODUCTION, BIOMASS AND STRUCTURE IN A NORTHERN ESTUARINE AREA OF THE BALTIC SEA,
Salt and Water Ltd., Helsinki (Finland).
For primary bibliographic entry see Field 5A.
W79-10197

RATIO ATP/CHLOROPHYLL AS AN INDEX *OF RIVERS' WATER QUALITY*,
Istituto di Ricerca Sulle Acque, Rome (Italy).
For primary bibliographic entry see Field 5A.
W79-10198

EFFECTS OF EXPERIMENTAL OIL SPILLS ON CHIRONOMIDAE IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10199

INTRODUCTION OF WASTE HEAT AND EFFECTS ON MICROORGANISMS,
Bundesanstalt fuer Gewasserkunde, Coblenz (Germany, F.R.).
For primary bibliographic entry see Field 5A.
W79-10200

INFLUENCE OF BEDLOAD TRANSPORT ON THE MACROBENTHOS OF RUNNING WATERS,
Bonn Univ. (Germany, F.R.). Inst. fuer Landwirtschaftliche Zoologie und Bienenkunde.
For primary bibliographic entry see Field 5A.
W79-10201

RELATIVE TOLERANCE OF SOME SALMONIDS TO ACID WATERS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-10202

MUDDY OFF-FLAVOUR IN BREAM (ABRAMIS BRAMA L.) FROM THE PORVOO AREA, GULF OF FINLAND,
Helsinki Univ. (Finland). Dept. of Limnology.
For primary bibliographic entry see Field 5A.
W79-10203

THE PRESENT STATE OF FISHING IN LESTIJOKI, A SMALL RIVER IN FINLAND,
Oulu Univ. (Finland).
For primary bibliographic entry see Field 5A.
W79-10205

INFLUENCE OF TEMPERATURE ON FEEDING, GROWTH AND MORTALITY OF PIKEPERCH AND PERCH,
Rijksinstituut voor Visserijonderzoek, IJmuiden (Netherlands).
J. Willemsen.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 2127-2133, 1978. 4 fig, 13 ref.

Descriptors: Freshwater fish, Yellow perch, *Water temperature, *Cooling water, *Thermal powerplants, *Thermal pollution, Growth, Pikeperch, The Netherlands, Lake Ijssel, Fish food, Flevo powerplant, Bioassays, Laboratory tests, Critical thermal maximum, Upper lethal limit, Water pollution sources.

Two important species of fish, the pikeperch and the yellow perch congregate in the discharge area of the Flevo-powerplant (Lake Ijssel) at temperatures up to 30-31 degrees C. The population density of pikeperch is 300 times that of the species in the lake. It was concluded that in a temperate climate, the discharge of cooling water about 7 degrees C above that of the receiving water is not harmful to pikeperch and perch and stimulates the abundance of food. A slight increase in temperature will stimulate fish growth. (Katz-EIS)
W79-10206

EFFECT OF THE GREEN ALGAE SCENEDESMUS OBLIQUUS AND CHLORELLA VULGARIS ON HETEROTROPHIC BACTERIA IN POLLUTED WATERS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Lab.
For primary bibliographic entry see Field 5A.
W79-10207

USE OF BIOTIC INDICES AS A TOOL FOR WATER QUALITY ANALYSIS IN RIVERS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-10208

THE DISSOLVING OF SOME PHOSPHORUS MINERAL COMPOUNDS BY MICRO-ORGANISMS IN THE BOTTOM SEDIMENTS OF FERTILIZED LAKES (IN POLISH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Hydrobiology and Water Conservation.
For primary bibliographic entry see Field 5A.
W79-10209

STUDIES ON THE TOXICITY OF A FEW PESTICIDES ON COLISA FASCIATUS AND NOTOPTERUS NOTOPTERUS WITH REFERENCE TO HISTOPATHOLOGY AND HISTOCHEMISTRY. PART 1: BIOASSAY STUDIES,
D.A.V. Coll. Muzaffarnagar (India). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10212

ALUMINUM SULFATE (ALUM) FOR PRECIPITATING CLAY TURBIDITY FROM FISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquaculture.
For primary bibliographic entry see Field 5A.
W79-10214

EMBRYOTOXIC AND TERATOGENIC EFFECTS OF CRUDE OIL ON MALLARD EMBRYOS ON DAY ONE OF DEVELOPMENT,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
D. J. Hoffman.
Bulletin of Environmental Contamination and Toxicology, Vol. 22, p 632-637, 1979. 1 fig, 1 tab, 7 ref.

Descriptors: *Mallard duck, *Oil, *Toxicity, Bird eggs, Embryonic growth stage, Organic compounds, Growth rates, Mortality, Oil pollution, Mode of action, *Crude oil, *Teratogens.

Fertile eggs of mallard ducks (Aras platyrhynchos) were randomly divided into five groups and treated at 24 h of development as follows: untreated controls, 10 micro L of a mixture of 9 aliphatic hydrocarbons and 1, 5, or 10 micro L of South Louisiana crude oil. External applications of crude oil on eggs resulted in a major decline in embryonic survival 3 days after treatment. By day 18 of development the percentage of survivors in the crude oil-treated groups ranged from 1.4 to 57%. Treatment with aliphatic hydrocarbons (paraffin) had no effect on survival. Mean embryonic weights were significantly lower in the crude oil-treated group. Abnormalities included deformed bills, incomplete ossification of the phalanges, reduction in the size of liver lobes, and general stunting with incomplete feather formation. Single instances of reduction in the number of ribs, abnormal cervical vertebrae, and spina bifida occurred. Treatment with aliphatic hydrocarbons did not result in any of these effects. (Deal-EIS)
W79-10216

HEMATOLOGY AS INDEX OF SUBLETHAL TOXICITY OF ZINC IN A FRESHWATER TELEOST,
Gorakhpur Univ. (India). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W79-10218

ORGANOCHLORINE RESIDUES IN RAPTOR EGGS IN THE CAYUGA LAKE BASIN,
National Wildlife Federation, Washington, DC.
For primary bibliographic entry see Field 5B.
W79-10220

BEHAVIORAL RESPONSES OF SHINER PERCH TO CHLORINATED PRIMARY SEWAGE EFFLUENT,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5A.
W79-10221

TAURINE AND GLYCINE IN THE GILLS OF THE CLAM PROTOTHACA STAMINEA EXPOSED TO CHLORINATED SEAWATER,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5A.
W79-10222

GROWTH CHANGES IN A POPULATION OF WHITEFISH IN LAKE ERIE,
Pennsylvania Fish Commission, Harrisburg.

R. B. Kenyon.
New York Fish and Game Journal, Vol. 25, No. 2, p 129-139, 1978. 2 fig, 3 tab, 18 ref.

Descriptors: *Fish populations, *Growth rates, Lake Erie, Commercial fishing, Size, Length, Weight, Trophic level, Fish physiology, Habitats, Pennsylvania, Dissolved oxygen, *Whitefish.

Experimental data collected from whitefish in the Pennsylvania waters of Lake Erie from 1971 to 1974 were used to describe the population since its drastic decline after the late 1940's. Growth was calculated and compared with that of the whitefish population of the late 1920's when the stocks were considered abundant. Several body-scale functions were tested for best fit, and the functional geometric mean regression permitted the closest fit to empirical data for mean length. Calculated growth curves for both periods were transformed to Walford regression lines, and the indicated lower rate of growth in recent years was deemed significant. A significant increase in weight per unit of length between the two periods was indicated by length-weight regressions (log transformations). Probable explanations for these changes are discussed, focusing primarily on climatology, the trophic state of Lake Erie and the zoogeography and abundance of whitefish. (Deal-EIS)
W79-10223

AN ASSESSMENT OF THE IMPORTANCE OF TEMPERATURE AS A FACTOR CONTROLLING THE GROWTH RATE OF BROWN TROUT IN STREAMS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5A.
W79-10225

SHRIMPING AS A SOURCE OF SUSPENDED SEDIMENT IN CORPUS CHRISTI BAY (TEXAS),
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, H. H. Carter, and W. M. Wise.
Estuaries, Vol. 2, No. 3, p 201-203, 1979. 3 fig, 1 ref.

Descriptors: *Suspended solids, *Commercial fishing, *Trawling, Shrimp, Commercial shellfish, Bottom sediments, Turbidity, Dredging, Channel improvement, Sediments, Texas, Corpus christi Bay.

A field study showed that the total amount of sediment disturbed in Corpus Christi Bay each year by shrimp trawling is 10-100 times greater than that dredged in an average year for maintenance of shipping channels. The maximum concentrations of suspended sediment measured in the trails of the shrimp boats were comparable to those observed in the turbid plume off the discharge of the dredge operating in the same area. This is not to suggest that the increased levels of suspended sediment resulting from either of these important activities has a deleterious effect on the biota of Corpus Christi Bay. (Deal-EIS)
W79-10226

BIOASSAY OF BALTIMORE HARBOR SEDIMENTS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5A.
W79-10227

GROWTH RATES OF JUVENILE MAOMAO, ABUDEFDUF ABSOMINALIS, AT CONSTANT AND CYCLIC TEMPERATURES,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5A.
W79-10230

STUDIES OF HERBICIDE TOXICITY IN SOME FRESHWATER FISHES AND ECTOPROCTA,
Vikram Univ., Ujjain (India). School of Studies in Zoology.
For primary bibliographic entry see Field 5A.
W79-10231

GASTRIC EVACUATION IN PLAICE, PLEURONECTES PLATESSA L.: EFFECTS OF TEMPERATURE AND MEAL SIZE,
Glasgow Univ. (Scotland). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10234

PHYTOPLANKTON ECOLOGY OF THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
Fisheries and Marine Service, Vancouver (British Columbia). Pacific Environment Inst.
J. G. Stockner, D. D. Cliff, and K. R. S. Shortreed.
Journal of the Fisheries Research Board of Canada, Vol. 36, No. 6, p 657-666, June 1979. 8 fig, 2 tab, 41 ref.

Descriptors: *Estuaries, *Surveys, *On-site investigations, *Phytoplankton, *Canada, Water quality, Primary productivity, Straits, Ecology, Sampling, Analytical techniques, Testing procedures, Salinity, Water temperature, Data collections, Biomass, Dissolved oxygen, Nitrogen, Phosphorus, Foreign research, Zooplankton, Algae, *British Columbia, *Strait of Georgia, *Fraser River.

Observations of phytoplankton production, abundance, and distribution were made at 16 stations in the Strait of Georgia from 1975 to 1977. The primary objectives of this study were (1) to describe over two growing seasons the wax and wane of phytoplankton populations, including their production, distribution, and seasonal succession; (2) to assess, where possible, the impact of natural and man-induced stress on phytoplankton; and (3) to compare recent annual and daily primary production rates with earlier published values from the strait and with world oceanic and coastal marine values, so as to place in perspective the production potential of the Strait of Georgia. The discharge of turbid Fraser River water exerts a strong influence on phytoplankton production and distribution in surface waters by rapid light attenuation and horizontal advection. At plume boundaries and back eddies where light conditions improve, very high production occurs (more than 4-5 gC/sq m/d), because of rapidly replenished nutrients supplied by the Fraser River. Advection, turbulence, zooplankton grazing, and summer nitrate depletion collectively impart a heterogeneous distribution pattern to phytoplankton in the surface waters of the Strait of Georgia. Mean annual production varies from lows of 150 gC/sq m in Fraser River plume to highs of over 500 gC/sq m in sheltered boundary waters of inlets. Recent increases in ammonia and nitrate from land drainage and domestic sewage, mainly through the Fraser River, are related to increases in phytoplankton standing stocks in the Strait. (Humphreys-ISWS)
W79-10261

SURFACE TENSION OF A POLLUTED RIVER WATER,
National Inst. for Environmental Studies, Yatabe (Japan).
For primary bibliographic entry see Field 5A.
W79-10269

CHANGES IN THE AMOUNT OF ORGANOCHLORINE PESTICIDES IN MACROINVERTEBRATE COMMUNITIES OF THE VAL PARMA RUNNING WATERS (ITALY),
Parma Univ. (Italy). Lab. di Ecologia.
For primary bibliographic entry see Field 5A.
W79-10270

EFFECTS OF EFFLUENTS FROM A VARIETY OF SEWAGE TREATMENT METHODS ON PRIMARY PRODUCTIVITY, RESPIRATION AND ALGAL COMMUNITIES IN ARTIFICIAL STREAM CHANNELS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-10271

PHENOMENOLOGY AND MODELLING OF HEAVY METAL DISTRIBUTION IN LAKES,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5A.
W79-10273

PONTOPOREIA DISTRIBUTION ALONG THE KEWEENAW SHORE OF LAKE SUPERIOR AFFECTED BY COPPER TAILINGS),
Michigan Technological Univ., Houghton, MI. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W79-10274

PHYTOPLANKTON POPULATION DYNAMICS AND PRODUCTIVITY IN A SEWAGE-ENRICHED TIDAL CREEK IN NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-10275

BY-PRODUCTS OF OXIDATIVE BIOCIDES: TOXICITY TO OYSTER LARVAE,
Yale Univ., New Haven, CT. School of Forestry and Environmental Studies.
M. E. Stewart, W. J. Blogoslawski, R. Y. Hsu, and G. R. Helz.
Marine Pollution Bulletin, Vol. 10, p 166-169, 1979. 1 fig, 1 tab, 18 ref.

Descriptors: *Chlorine, Chlorination, Bioassay, Toxicity, Mortality, Laboratory tests, *Oysters, Larvae, Crassostrea virginica, *Ozone, Ozonization, Power plants, Sewage treatment, Disinfection, Bromate, Bromoform, *Chloroform, Oxidation byproducts.

Selected by-products which are produced upon chlorination or ozonization of seawater were examined for their effect on eastern oyster (Crassostrea virginica) larvae. The compounds, bromate, bromoform, and chloroform, were studied at 0.05, 0.1, 1.0, and 10.0 mg/l. Repeated bioassays indicated that even at these low levels, all three substances produced some larval mortality. This preliminary study suggests that oxidation by-products formed during chlorination or ozonization of power plant cooling waters may have adverse effects upon the growth of marine invertebrates, such as C. virginica, during their delicate larval stages. (Katz-EIS)
W79-10276

INHIBITION OF ESTUARINE BACTERIA BY METAL REFINERY EFFLUENT,
Hull Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5A.
W79-10277

SEXUAL MATURATION AS A SOURCE OF VARIATION IN THE RELATIONSHIP BETWEEN CADMIUM CONCENTRATION AND BODY WEIGHT OF MYTILUS EDULIS L.,
Institut National de la Recherche Scientifique, Rimouski (Quebec). Lab. Oceanographique.
For primary bibliographic entry see Field 5A.
W79-10278

LIMNOLOGICAL OBSERVATIONS ON A RECENTLY DREDGED POND (GRAVEL-PIT),
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (Germany, F.R.).
For primary bibliographic entry see Field 5A.
W79-10281

SOME ECOLOGICAL LIMITS OF TOLERANCE OF OCHROMONAS SOCIABILIS,
Konstanz Univ. (Germany, F.R.). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-10283

DEVELOPMENT OF PLANKTONIC ALGAE IN THE RUHR RIVER DEPENDENT ON NUTRIENT SUPPLY, WATERFLOW, IRRADIANCE AND TEMPERATURE,
Ruhr River Association, Essen (Germany, F.R.). Chemical and Biological Lab.
For primary bibliographic entry see Field 5A.
W79-10284

SAPROBIOLOGICAL EVALUATION OF DUTCH DITCHES USING BENTHIC ALGAE ON ARTIFICIAL SUBSTRATES,
Water Board of the Rhine District, Leiden (Netherlands).
For primary bibliographic entry see Field 5A.
W79-10285

VERTEBRAL DYSPLASIA IN YOUNG FISH EXPOSED TO THE HERBICIDE TRIFLURALIN,
Environmental Research Lab., Gulf Breeze, FL.
J. A. Couch, J. T. Winstead, D. J. Harsen, and L. R. Goodman.
Journal of Fish Diseases, Vol. 2, p 35-42, 1979. 8 fig, 20 ref.

Descriptors: *Fish disease, *Water pollution effects, *Herbicides, *Calcium, *Fish pathology, *Growth stages, *Vertebral dysplasia, *Sublethal effects, Minnows, Cyprinodon, Laboratory tests, Environmental effects, Bioassay, Trifluralin, Fish physiology, Pathology, Pre-emergents, Juvenile fish, Histology, Pesticides.

Sheepshead minnows, Cyprinodon variegatus, exposed to 5.5 to 31 microgr/l of the herbicide trifluralin, throughout their first 28 days of life, developed a heretofore undescribed vertebral dysplasia. This dysplasia consisted of semisymmetrical hypertrophy of vertebrae (three to 20 times normal), characterized by foci of osteoblast and fibroblasts actively laying down bone and bone precursors. Effects of the abnormal vertebral development were dorsal vertebral growth into the neural canal, ventral compression of renal ducts, and longitudinal fusion of vertebrae. Fish, exposed for 51 days to 16.6 microgr/l trifluralin and thereafter depurated for 41 days, showed no increase in vertebral dysplasia during depuration; however, residual spinal column damage was evident. Serum calcium concentrations were elevated in adult fish exposed for 4 days to 16.6 microgr/l trifluralin. Fluorosis or mimicry of hypervitaminosis A are considered possible mechanisms for the osseous effect, but are not considered to be the only possible causes. The highly predictable nature of this disorder in experimental exposures strengthens the probability that young fish may serve as experimental models for determining effects of chemicals on early vertebrate ontogeny, particularly in regard to skeletal development. (Katz-EIS)
W79-10286

EFFECT OF DIETARY MIREX AND PCB (AROCLOR 1254) ON THYROID ACTIVITY AND LIPID RESERVES IN RAINBOW TROUT SALMO GAIRDNERI RICHARDSON,
Guelph Univ. (Ontario). Dept. of Zoology.
J. F. Leatherland, and R. A. Sonstegard.
Journal of Fish Diseases, Vol. 2, p 43-48, 1979. 2 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, *Fish physiology, *Water pollution effects, *Mirex, *Rainbow trout, *Sublethal effects, Thyroid activity, Fish diets, Histology, Pesticides, Hormones, Metabolism, Laboratory tests, Bioassays, Trout, Salmonids, Salmo gairdneri.

Rainbow trout were fed diets contaminated with either PCB (Aroclor 1254, 500 microgr/gr dry food) or Mirex (500 microgr/gr dry food). There was no apparent effect of PCB on thyroid histology or on serum thyroid hormone levels. Mirex effected significant reductions in serum T4 and T3 levels without apparent change in the histological appearance of the thyroid. Liver weights and total liver lipid content were significantly greater in PCB-fed fish compared with controls as was the carcass lipid content. Mirex had no apparent effect on liver size or liver lipid content but there was a decline in carcass lipid content which persisted 25 days after returning Mirex-fed fish to the control diet. (D. Katz-EIS)
W79-10287

AN ATTEMPTED POLLUTION ABATEMENT IN THE GULF OF LA NAPOULE (CANNES, FRANCE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W79-10288

EFFECTS OF SELFPURIFICATION AND THE BENTHIC ORGANIC LOAD ALONG A STREAM POLLUTED BY A PIGGERY, (IN FRENCH),
Centre Universitaire de Chambery (France).
For primary bibliographic entry see Field 5A.
W79-10290

INDICATOR COMMUNITIES OF OLIGOCHAETES IN SCANDINAVIAN LAKES,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10293

EFFECTS OF SOME PETROCHEMICAL PRODUCTS ON THE SURVIVAL OF DICRANOPHORUS FORCIPATUS O.F. MULLER (ROTATORIA) UNDER LABORATORY CONDITIONS,
Zagreb Univ. (Yugoslavia). Dept. of Zoology.
R. Erben.
Verhandlungen Internationale Vereinigung fur Theoretische und Ungewandte Limnologie, Vol. 20, Part 3, p 1986-1991, 1978. 2 tab, 6 ref.

Descriptors: Oil, Oil spills, *Toxicity, Mortality, *Bioassay, Water pollution effects, *Phenol, Acetophenone, Mesityloxide, Styrene, Benzene, *Ethylbenzene, Cumene, Toluene, Acetone, Laboratory test, Phenol degrading bacteria, Protozoa, Petrochemicals.

The effects of phenol, acetophenone, mesityloxide, styrene, a-methyl-styrene, benzene, ethylbenzene, cumene, toluene and acetone on the species Dicranophorus forcipatus in the closed laboratory system, were examined. The concentrations of phenol were: 10, 20, 100, 200, 300 and 400 mg/l, and of the other compounds were 0.02, 0.2 and 2% (v/v). With phenol, the number of heterotrophic and phenol degrading bacteria were observed. Phenol acts directly toxically in acute conditions, while during chronical conditions the toxicity is reduced, due to biodegradation by phenol bacteria. Other petrochemicals prevent aeration and the animals die because of the lack of oxygen. However, the reduced toxicity of the compounds is due to their evaporation. (Katz-EIS)
W79-10294

EFFECTS OF THERMAL DISCHARGE ON LEAF DECOMPOSITION IN A RIVER ECOSYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W79-10295

EFFECT OF A STEAM ELECTRIC GENERATING STATION ON THE EMERGENCE TIMING OF THE MAYFLY, HEXAGENIA BILINEATA (SAY),
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5A.
W79-10296

A SCANNING ELECTRON MICROSCOPIC STUDY OF PERIPHYTON COLONIZATION IN A SMALL STREAM SUBJECTED TO SODIUM CHLORIDE ADDITION,
Brock Univ., St. Catharines (Ontario). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W79-10297

EFFECTS OF PULP MILL AND MUNICIPAL EFFLUENTS AND HUMUS LOAD ON THE MACRO- AND MEIOZOOBENTHOS OF SOME FINNISH LAKES,
Jyvaskyla Univ. (Finland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5A.
W79-10298

EFFECT OF AGE, WEIGHT, AND SEX ON THE MERCURY CONTENT IN THE MUSCLES AND SELECTED ORGANS OF NORTHERN PIKE (ESOX LUCIUS L.), (IN POLISH),
Instytut Technologii zym Zywnosci Pochodzenia Morskiego, Szczecin (Poland).
For primary bibliographic entry see Field 5A.
W79-10299

PRELIMINARY EXPERIMENTS WITH SEA URCHIN PLUTEUS AND METAMORPHOSIS IN MARINE POLLUTION BIOASSAY,
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5A.
W79-10300

CONCENTRATIONS OF PCBS, BHCS AND DDTS RESIDUES IN SEAWEEDS OF THE EAST COAST OF SICILY,
Catania Univ. (Italy). Inst. di Chimica e Chimica Industriale.
For primary bibliographic entry see Field 5A.
W79-10301

EFFECT OF A PUMP-STORAGE HYDROELECTRIC SCHEME ON THE STRATIFICATION AND ECOLOGY OF A SCOTTISH LOCH,
Glasgow Univ. (Scotland). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10302

SOME PRELIMINARY DATA ON NUTRIENTS AND CHLOROPHYLL IN ORGANICALLY POLLUTED RIVERS (GRANADA/SOUTH SPAIN),
Granada Univ. (Spain). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10303

EFFECT OF HYDROLOGICAL CHANGES ON AQUATIC COMMUNITIES IN THE LOWER JORDAN RIVER,
Hebrew Univ., Jerusalem (Israel). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W79-10304

SUITABILITY OF ACTIVATED AH-FILTERED WATER TO STUDY DEVELOPMENT OF SALMONID EMBRYOS, (IN POLISH),
Institute of Icthyology, Szczecin (Poland). Zaklad Anatomii i Embriologii Ryd.
For primary bibliographic entry see Field 5A.
W79-10307

CHANGES IN DDT, DDE AND DDD CONTENTS DURING PRODUCTION OF CANNED HERRING (THE 'GDANSK HERRING'), (IN POLISH),
Instytut Technologii zym Zyrnosci Pochodzenia Morskiego, Szczecin (Poland). Zaklad Higieny Przemyslu Rybengo.
For primary bibliographic entry see Field 5A.
W79-10308

INDICATOR VALUE OF FRESHWATER OSTRACODA,
Prague Dept. of Water Technology and Environmental Engineering (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W79-10309

THE EFFECT OF OSMOTIC STRESS ON THE SURVIVAL AND RESPIRATION OF THE STONEFLY NYMPH, PARAGNETINA MEDIA,
For primary bibliographic entry see Field 5A.
W79-10313

EFFECTS OF GRANULAR 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) ON BENTHIC MACROINVERTEBRATES IN A LAKE ENVIRONMENT),
National Fishery Research Lab., LaCrosse, WI.
For primary bibliographic entry see Field 5A.
W79-10314

EFFICACY OF ANTIMYCIN FOR CONTROL OF LARVAL SEA LAMPREYS (PETROMYZON MARINUS) IN LENTIC HABITATS,
National Fishery Research Lab., LaCrosse, WI.
For primary bibliographic entry see Field 5A.
W79-10315

THE TOXICITY OF A PRESUMPTIVE STEEL WORKS EFFLUENT FORMULATION,
University of Strathclyde, Glasgow (Scotland). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-10319

5D. Waste Treatment Processes

TECHNOLOGICAL RESPONSE TO SPILLS OF HAZARDOUS SUBSTANCES,
National Science Foundation, Washington, DC. Div. of Advanced Environmental Research and Technology.
E. H. Bryan.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 727-739, 1977. 1 fig, 15 ref.

Descriptors: *Pollutants, *Water pollution, *Waste treatment, *Water pollution control, Equipment, Water treatment, Hazards, Accidents, Waste disposal, Chemicals, Carbon filters, Activated carbon, On-site investigations, Water quality control, *Little Menomonee River(WI), Spills, Hazardous substance spills.

The transport of products from producers to consumers by truck, barge, rail, plane, and pipeline poses a constant threat of sudden and unpredictable accidental contamination of water in our drainage basins. The threat to regional environmental quality and particularly the water ecosystem is analogous to that posed by point and nonpoint sources of pollution, differing principally in unpredictability as to the exact time and place of the accident, specific nature of the pollutant, and the uncertainty of its potential effect on the drainage basin. This paper discussed the circumstances that led to the evaluation of a prototype environmental emergency response unit. This was documented in a film conceived by the Citizens for Menomonee River Restoration, Incorporated, funded by the Environmental Protection Agency, and produced by Swanson Productions, Incorporated, titled: 'Once a River.' (See also W79-10107) (Sims-ISWS)
W79-10119

PRETREATMENT UPDATE,
A. Adamczyk.
Clearwaters, New York Water Pollution Control Association, Inc., Vol. 9, No. 2, p 16, June 1979.

Descriptors: *Pre-treatment(Water), *New York, *Toxins, *Industrial wastes, Municipal water, Waste water treatment, Sludge, Water pollution, Governments, Water quality control, Sewage sludge, Water treatment.

On April 12, 1979, the State of New York requested authorization to administer the national pretreatment program from the U.S. Environmental Protection Agency. The program is designed to regulate the industrial discharge of toxic substances into municipal wastewater treatment systems. Program regulation objectives are to: prevent toxic pollutants that interfere with municipal wastewater treatment facility operation, prevent toxic pollutants that may pass through treatment facilities untreated, and prevent toxic pollutants that would effect the disposal of large volumes of municipal sludge. It will be very difficult if not impossible to implement the program within the required timeframe. The program probably will most severely affect 4,000 of the State's industries and 55 of the States' large municipalities. While local, State, and Federal governments will be involved, it is the local and State governments that are responsible for the actual implementation and enforcement of the program regulations. Municipalities and industries must begin pretreatment no later than July 1, 1983. Federal funding of 75% of eligible costs will be through the EPA and New York State will provide 12 1/2% of the costs. (Seigler-IPA)
W79-10156

EFFECT OF THE GREEN ALGAE SCENEDESMUS OBLIQUUS AND CHLORELLA VULGARIS ON HETEROTROPHIC BACTERIA IN POLLUTED WATERS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Lab.
For primary bibliographic entry see Field 5A.
W79-10207

SETTLING UNIT FOR CIRCULATED COKE QUENCHING WATER,
Firma Carl Still, Recklinghausen (Germany, F.R.). (Assignee).
J. Stratmann, and M. Strobel.
U.S. Patent No. 4,151,082, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1389, April 24, 1979.

Descriptors: *Patents, *Waste water treatment, *Industrial water, *Water pollution treatment, Settling basins, Separation techniques, Equipment, Water reuse, Closed cycle systems, Coke quenching water.

An improved device for treating water which has been used for the quenching of coke includes a settling basin having at least one sidewall which is substantially vertical and which has a drain surface alongside it which slopes downwardly to the sidewall. It includes a conduit for supplying quenching water over the entire width of the basin. A sludge remover in the form of a dredger shovel is carried on a carriage which may be manipulated to remove the sludge from the bottom of the basin and to advantageously hold it so that the water drains from it through openings in the bucket or shovel. It is then deposited on the drain for further draining of the water back to the basin. (Sinha-OEIS)
W79-10219

SYSTEM AND APPARATUS FOR CONTROL AND OPTIMIZATION OF FILTRATION PROCESS,
Enviro Development Co., Inc., Mountain View, CA. (Assignee).
M. M. Zuckerman, and L. C. Hamer.
U.S. Patent No. 4,151,080, 9 p, 2 fig, 14 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1388, April 24, 1979.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Separation techniques, Control systems, Filtration, Dewatering, Filters, Equipment.

A process control apparatus and system for dewatering a solids ladened slurry of water and waste water employs one or more of four primary process control techniques, depending upon the particular process application. The four process control techniques are: (1) monitoring of the instantaneous solids concentration increase in the dewatering unit, (2) measurement of the rate of change of the solids concentration increase with respect to time, (3) controlled pumping to produce a substantially constant flow rate in the effluent from the dewatering unit until the terminal dewatering pressure is reached, and (4) variation on the amount of conditioning agents added to the influent slurry in response to one or more control signals derived from other components of the dewatering system and apparatus. (Sinha-OEIS)
W79-10233

PROCESS FOR ELIMINATION OF MERCURY FROM INDUSTRIAL WASTE WATERS BY MEANS OF EXTRACTION WITH SOLVENTS,
E. D. Nogueira, A. L. R. Abad, M. B. Muntadas, and J. M. R. Vega.
U.S. Patent No. 4,151,077, 6 p, 1 fig, 22 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1387, April 24, 1979.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Mercury, Separation techniques, Solvents, Solvent extractions, Organic compounds, Product recovery.

A process for eliminating mercury from industrial waste waters by means of extraction with solvents is described, which includes its treatment with an oxidant agent to pass the whole of the mercury to its state of valence Hg++, its subsequent treatment by direct contact with a reducer in order to eliminate the excess oxidant which otherwise would degrade the agent of extraction and with an organic solution that contains the agent that extracts the mercury and leaves it free from the latter for its evacuation into the environment, and regeneration of the agent of extraction by means of its treatment with an aqueous solution of chloride ions, the mercury being recovered in the form of an aqueous solution of mercuric chloride, relatively concentrated. (Sinha-OEIS)
W79-10249

WINTER SPRAY IRRIGATION OF SECONDARY MUNICIPAL EFFLUENT,
Michigan Dept. of Public Health, Lansing.
D. E. Leland, D. C. Wiggert, and T. M. Burton.
Journal of the Water Pollution Control Federation, Vol. 51, No. 7, p 1850-1858, July 1979. 6 fig, 6 tab, 10 ref. EPA R005143-01.

Descriptors: *Sewage effluents, *Waste water treatment, *Irrigation, Sprinkler irrigation, Waste water disposal, Municipal wastes, Runoff, Groundwater, Infiltration, Winter, Ice, Frost, Frozen soils, Phosphorus, Nitrogen, On-site investigations, Data processing, Water pollution, Water pollution sources, Water pollution control, Land application, Spray irrigation, Cold weather.

Land application of municipal effluent in cold climates currently requires wastewater storage for up to 6 months annually. In this study, a 3-ha watershed was irrigated with secondary municipal effluent from East Lansing, Michigan, on a year-round basis with the purpose of assessing the feasibility of land irrigation during cold weather. This irrigation resulted in a heavy ice cover that insulated the soil, reduced soil frost, and allowed infiltration of over 70% of the wastewater. Phosphorus retention in the soil was high (77%), but initial runoff concentrations during ice-melt exceeded 1 mg phosphorus per liter. This high phosphorus runoff was only a small percentage of cold weather loading. Significant infiltration of nitrate-nitrogen to the groundwater occurred. Combined lagoon-land irrigation treatment systems seem to have potential for effective cold season operation with substantial reduction in required storage. (Sims-ISWS)
W79-10257

EFFECTS OF EFFLUENTS FROM A VARIETY OF SEWAGE TREATMENT METHODS ON PRIMARY PRODUCTIVITY, RESPIRATION AND ALGAL COMMUNITIES IN ARTIFICIAL STREAM CHANNELS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-10271

PHENOMENOLOGY AND MODELLING OF HEAVY METAL DISTRIBUTION IN LAKES,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5A.
W79-10273

BY-PRODUCTS OF OXIDATIVE BIOCIDES: TOXICITY TO OYSTER LARVAE,
Yale Univ., New Haven, CT. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 5C.
W79-10276

WASTE WATER TREATING APPARATUS,
Seiisui Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
N. Iwai, and T. Okumura.
U.S. Patent No. 4,149,972, 7 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 1018, April 17, 1979.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Microorganisms, Aerobic conditions, Equipment.

A waste water treating apparatus comprises thin fan-shaped sheets made of an unfoamed synthetic resin and is assembled via spacers. A tubular member made of a synthetic resin is inserted through holes in the fan shaped sheets and holes in the spacers to form an assembly of the sheets. The assembly is radially placed around a rotating shaft and forms a generally circular rotary body. This rotary body is placed within a waste water treating tank, and the apparatus is operated by rotating the rotary body while it is dipped in waste water to a depth corresponding to about half of its height in the diametrical direction. The waste water is treated by the action of aerobic microorganisms that grow adhering to the rotary body. The fan-shaped sheets which constitute the rotary body permit good adhesions of the microorganisms. (Sinha-OEIS)
W79-10318

APPARATUS FOR REMOVING IMPURITIES FROM WASTE WATER,
Bouligny (R. H.), Inc., Charlotte, NC. (Assignee).
S. A. Rojo.
U.S. Patent No. 4,149,953, 10 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 1013, April 17, 1979.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Separation techniques, Electrolysis, Adsorption, Flocculation, Electrodes, Aluminum and iron electrodes.

A treating chamber operable as an electrolytic cell is provided, in which the electrodes have large surface areas relative to the volume of the electrolyte. The anode is composed of a quantity of aluminum particles and the cathode is composed of a quantity of iron particles placed in close proximity to the aluminum. Waste water containing impurities is introduced into the treating chamber and utilized as the electrolyte. An electric current is applied to the electrodes to dissolve aluminum and iron, and produce floc in the treating chamber. The impurities in the water are adsorbed and retained by the floc. The waste water may be continuously recirculated from the treating chamber to a holding chamber, or may be moved across the aluminum and iron electrodes in a continuous flow-through system at a predetermined flow rate. The floc containing the adsorbed impurities is separated from the water by conventional means. As an alternative, clean water containing normal dissolved solids may be introduced into the treatment chamber and utilized as the electrolyte. An electric current is applied to the aluminum and iron electrodes to produce floc. Floc-laden clean water is conveyed to a chamber containing waste water, and mixed therewith. Floc containing impurities adsorbed from the waste water then is separated from the water by conventional means. (Sinha-OEIS)
W79-10324

FISH TOXICITY WITH SPECIFIC REFERENCE TO THE PULP AND PAPER INDUSTRY,
Domtar Ltd., Montreal (Quebec).
R. J. P. Brouzes.
In: Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975). p 81-124, 1976. 3 fig, 8 tab, 105 ref, 2 append.

Descriptors: *Bioassay, *Toxicity, *Fish, *Pulp and paper mills, *Waste water treatment, Recycling, Ammonia, Dissolved solids.

Fish bioassay methods are reviewed, and the nature of materials within a mill which are deleterious to the environment as defined by bioassay is discussed. Bioassay to determine the median lethal time and the median lethal concentration is described. Factors which affect the survival of fish near pulp and paper mill effluents include ammonia, carbon dioxide, chlorine, dissolved oxygen, dissolved solids, heavy metals, pH, resin acid and fatty acid soaps, slimicides, sulfur compounds, suspended solids, temperature, and other chemicals. Toxicants in the various process streams are characterized. A sulfite mill with recovery would reduce toxicity or toxicity could be reduced by treating selected process streams. (See also W77-07562) (Small-FRC)
W79-10325

PHYSICAL-CHEMICAL TREATMENT,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong.
In: Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975). p 125-169, 1976. 19 fig, 4 tab, 32 ref.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Waste treatment, *Separation techniques, Adsorption, Ion exchange, Filtration, Coagulation, Flocculation, Color, Toxicity.

Physical-chemical methods for the treatment of pulp mill wastes are outlined. At present, a complete economically viable physical-chemical treatment system is not available. The general principals of adsorption, ion exchange, adsorptive bubble separation, coagulation, flocculation, membrane separation including reverse osmosis, and ultrafiltration, are described. Applications include detoxification using PPRIC carbon treatment, granular carbon adsorption, and foam separation. Decolorization applications are tabulated. (See also W77-07562) (Small-FRC)
W79-10326

PROCESS FOR PURIFICATION OF WASTE WATER PRODUCED BY A KRAFT PROCESS PULP AND PAPER MILL,
Jet Propulsion Lab., Pasadena, CA.
M. F. Humphrey.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-17949, Price codes: A02 in paper copy, A01 in microfiche. Patent Application (NASA), (1976) 13 p.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Recycling, *Lignins, *Filtration, Waste water treatment, Chemical wastes, Activated carbon, Settling basins, Separation technique.

A simple and relatively inexpensive method was developed for purifying kraft process waste water and extracting the lignins. The wastes are dumped into a settling tank and a quaternary ammonium compound and activated carbon are added. The sludge which forms at the bottom of the tank is filtered, and the solid material is transferred to a dissolving tank and dissolved by adding methanol. The slurry which is formed is and the removed solid material is pyrolized to activated carbon which is reused. Lignin is separated from the remaining liquid. Most of the water recovered using the system is recycled. The recovered lignins are useful materials as they can be competitive with petrochemicals as a source of chemical raw materials. (Small-FRC)
W79-10329

DECONTAMINATION OF WATER CONTAINING CHEMICAL WARFARE AGENTS,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA.
D. C. Lindsten, and R. P. Schmitt.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A012 630, Price codes: A06 in paper copy, A01 in microfiche. Report 2125, 1975. 116 p, 35 fig, 14 tab, 7 ref.

Descriptors: *Chemical warfare, *Chemical wastes, *Chlorination, *Activated carbon, *Coagulation, Filtration, Demineralization, Ion exchange, Reverse osmosis, Protection, Waste water treatment, Water pollution treatment, Pollutant identification, Pollution sources.

Treatment methods for decontaminating waters cortaining chemical warfare (CW) agents were investigated. The maximum permissible concentrations of CW agents in water are 0.02 mg/liter nerve agents, 2.0 mg/liter blister agents, 2.0 mg/liter arsenicals as arsenic, 20.0 mg/liter blood agents, and 0.004 mg/liter incapacitants. CBR-contaminated water may be purified by a combination of superchlorination in a Lister bag, activated carbon adsorption, coagulation, filtration, mixed-bed demineralization, and post chlorination. While the standard ERDLator unit did not remove CW agents from water, the use of the CW/BW pretreatment set, in combination with the ERDLator unit, decontaminated the water and incorporated superchlorination, activated carbon adsorption, coagulation, filtration, and post-chlorination. Reverse osmosis and ion exchange processes were capable of removing certain CW agents. Protective clothing and CW detection devices are also reviewed. (Lisk-FRC)
W79-10330

5E. Ultimate Disposal Of Wastes

EVALUATION OF THE GEOLOGIC AND HYDROLOGIC FACTORS RELATED TO THE WASTE-STORAGE POTENTIAL OF MESOZOIC AQUIFERS IN THE SOUTHERN PART OF THE ATLANTIC COASTAL PLAIN, SOUTH CAROLINA AND GEORGIA,
Geological Survey, Raleigh, NC. Water Resources Div., and Geological Survey, Lakewood, CO. Water Resources Div.
P. M. Brown, D. L. Brown, M. S. Reid, and O. B. Lloyd, Jr.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $4.75. Geological Survey Professional Paper 1088, 1979. 37 p, 1 fig, 11 plates, 8 tab, 52 ref.

Descriptors: *Underground waste disposal, *Liquid wastes, *Deep wells, *Atlantic Coastal Plain, *Subsurface mapping, Mesozoic Era, South Carolina, Georgia, Planning, Waste storage, Injection wells, Evaluation, *Waste-storage potential.

The report describes the subsurface distribution of rocks of Cretaceous to Late Jurassic( ) age in the Atlantic Coastal Plain, South Carolina, and Georgia, and examines their potential for deep-well waste storage into th part of the regional sediment mass which lies below the deepest zones containing usable ground waters. For the study, usable ground water is considered to be that which contains less than 10,000 mg/L dissolved solids. Using a group of geohydrologic parameters derived from or combining 21 categories of basic data, established from study and interpretation of well cuttings and geophysical logs, a series of 32 regional maps and 8 stratigraphic cross sections was constructed. For each of the eight geologic units delineated in the subsurface, the maps illustrate the distribution of waste-storage potential in terms of areal extent, depth below land surface, sand-shale geometry, and the approximate sodium chloride concentration of a unit's nonusable ground water. In areas where the geologic units contain nonusable ground water, the depth below land surface and the thickness of potential waste-storage reservoir and reservoir-seal combinations are variable.

The range in variability appears to be broad enough to meet the need for a wide choice among the geologic requirements that would normally be considered in selecting specific waste-storage sites for detailed examination. (Woodard-USGS)
W79-10184

WATER POLLUTION CONTROL POLICIES ARE GETTING RESULTS,
Organization for Economic Co-operation and Development, Paris (France). Directorate for the Environment.
J-P. Barde, G. M. Brown, and P. F. T. Buchot.
AMBIO, Vol. 8, No. 4, p 152-159, 1979. 8 fig, 3 tab, 7 ref.

Descriptors: *Water pollution control, *Water quality standards, Water quality, Water pollution treatment, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Regulation, Legislation, Metals, Pesticide residues, Organic wastes, Waste treatment, Chemical wastes, Industrial wastes.

Economic and regulatory approaches for water quality management are described. Important elements of the effluent charges system in France, the Netherlands, West Germany, Hungary and Czechoslovakia are cited. The water management structure in France, Finland, the United States, Japan, the Netherlands and England and Wales is touched upon. Empirical results for Japan, the United States, the Netherlands, France and Sweden indicate that at least for conventional pollutants (oxidizable substrate and suspended solids), water quality has ceased to deteriorate in the past decade and in some instances it has improved. (Deal-EIS)
W79-10189

WINTER SPRAY IRRIGATION OF SECONDARY MUNICIPAL EFFLUENT,
Michigan Dept. of Public Health, Lansing.
For primary bibliographic entry see Field 5D.
W79-10257

5F. Water Treatment and Quality Alteration

REGENERATION OF ION EXCHANGE RESINS,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
L. E. Horembala.
U.S. Patent No. 4,151,079, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1388, April 24, 1979.

Descriptors: *Patents, *Water treatment, *Industrial water, Boiler feed water, Water purification, Ion exchange, Resins, Anion exchange, Cation exchange, Potassium compounds, Regeneration.

Problems encountered with sodium leakage after regeneration of mixed bed and ion exchange units utilized to purify boiler feed waters can be reduced or eliminated by using as the regenerant for the anion exchange resin an aqueous solution of potassium hydroxide. Likewise, in the regeneration of cation condensate polishing units utilized to purify boiler feed waters, sodium leakage can be reduced or eliminated by utilizing a potassium salt as the regenerant. Additionally, potassium salts of various inorganic reducing agents can also be utilized to remove iron from ion exchange systems operated in the above manner. (Sinha-OEIS)
W79-10086

EVALUATION OF THE MICROBIOLOGY STANDARDS FOR DRINKING WATER.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-297 119, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-570/9-78-00C, 1978, 235 p.

Descriptors: *Coliforms, *Standards, *Chlorination, Water treatment, Regulation, Public health, Microbiology.

Papers were presented at a meeting held April 13-14, 1977 at the Office of Drinking Water, US Environmental Protection Agency, Washington, D. C. on current microbiological issues and problems associated with the coliform Maximum Contaminant Level and the determination of compliance. Technical problems are discussed, and the possibility of a chlorine residual standard is explored. Sixty-four people attended the conference, and twenty-seven papers were given. (See W79-10128 thru W79-10154) (Small-FRC)
W79-10127

EVALUATING THE MICROBIAL QUALITY OF POTABLE WATERS,
National Environmental Research Center, Cincinnati, OH. Water Supply Research Lab.
M. J. Allen, and E. E. Geldreich.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C, p 3-11, 1978. 1 fig, 3 tab, 21 ref.

Descriptors: *Potable water, *Coliforms, *Bioindicators, *Chlorination, Public health, Viruses, Filtration, Flocculation, Monitoring.

The coliform group of microorganisms is the most relevant sanitary index for drinking water. Studies have confirmed that when coliforms are used as an indicator, bacterial and viral safety of the water is assured. Present virological methodology is not developed enough to isolate viruses from finished waters. Present water treatment practices are capable of producing pathogen-free water consistently. Flocculation/filtration with chlorination are dependable biological safeguards. The chlorine dosage and contact times routinely used inactivate all bacterial and viral pathogens except for protozoan cysts. Constant surveillance is necessary to eliminate waterborne disease. (See also W79-10127) (Small-FRC)
W79-10128

INTERFERENCES TO COLIFORM DETECTION IN POTABLE WATER SUPPLIES,
National Environmental Research Center, Cincinnati, OH. Water Supply Research Lab.
E. E. Geldreich, M. J. Allen, and R. H. Taylor.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C, p 13-20, 1978. 4 tab, 23 ref.

Descriptors: *Potable water, *Turbidity, *Microorganisms, *Microflora, Water quality, Distribution, Coliforms, Regulation.

Interferences to coliform detection in potable water supplies including turbidity and microbial flora. Turbidity, which can be caused by, among other things, algal growth, siltation, industrial wastes, can be a transport vehicle for bacterial penetration of treatment barriers. Water must be free on interferences from tubidities that exceed the 1 NTU limit specified in the Interim Primary Drinking Water Regulations in order to detect coliform occurrences at a baseline of one organism per 100 ml. Bacterial densities over 500 organisms per ml should not be tolerated. Alterations in laboratory methodology can circumvent these interferences to some extent. The ultimate solution is in improved treatment practices and attention to minimizing deterioration of water quality during distribution. (See also W79-10127) (Small-FRC)
W79-10129

IMPACT OF THE COLIFORM STANDARD ON THE TRANSMISSION OF DISEASE,
Health Effects Research Lab., Cincinnati, OH.
G. F. Craun.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C, p 21-35, 1978. 1 fig, 12 tab, 7 ref.

Descriptors: *Diseases, *Monitoring, *Coliforms, *Microbiology, Water treatment, Water pollution, Regulation, Public health.

Outbreaks of waterborne diseases continue to occur, and data on the outbreaks should be used to plan and develop surveillance programs. Emphasis should be placed on surveillance of smaller water systems, particularly those serving travellers. Control programs should include the provision of adequate treatment of surface water sources to prevent outbreaks of giardiasis, assessment of groundwater contamination, maintenance of disinfection, and prevention of contamination of distribution systems. Bacteriological surveillance of water distribution systems for coliforms as proposed in the 1975 Interim Standards are adequate, but an alternative monitoring program is recommended. This program would allow the limited microbiological resources to concentrate on research activities including the etiologic agents responsible for outbreaks of gastrointestinal illness of unknown etiology. The emphasis would be on engineering evaluations or sanitary surveys. (See also W79-10127) (Small-FRC)
W79-10130

ALTERNATIVE INDICATORS OF WATER CONTAMINATION AND SOME PHYSIOLOGICAL CHARACTERISTICS OF HETEROTROPHIC BACTERIA IN WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
G. A. McFeters, J. E. Schillinger, and D. G. Stuart.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 37-48, 1978. 5 fig, 1 tab, 21 ref.

Descriptors: *Coliforms, *Potable water, *Bioindicators, *Regulation, Water treatment, Public health, Kinetics.

The most promising microorganisms and procedures that have been suggested to indicate water contamination of public health significance are listed, and studies dealing with comparative die-off kinetics of some indicator bacteria and pathogens are discussed. It is recommended that coliforms be retained as the primary group of indicator organisms with a slight relaxation of the Maximum Contaminant Level (MCL) but not less than 3/100 ml. A similar test to the standard plate count should be used as an index of other microorganisms that are present in water. If the total plate count or standard plate count exceed the MCL, then a Limulus lysate test should be performed. By enumeration of heterotrophic bacteria and their products, the safety of finished drinking waters can be determined. (See also W79-10127) (Small-FRC)
W79-10131

SOME STATISTICAL CONSIDERATIONS IN WATER QUALITY CONTROL,
National Institutes of Health, Bethesda, MD.
L. Muenz.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 49-55. 1978. 3 fig.

Descriptors: *Statistical models, *Sampling, *Coliforms, *Bioindicators, Public health, Water treatment, Diseases, Analytical methods, Regulation.

Some statistical aspects of water sampling are explored. Analyses are presented based on the membrane filter method and the assumption that coliform indicators are valuable. Three topics are investigated: how many samples per month are necessary for various size towns, how large should each sample be, and are the present sampling rules (based on the interim regulations of December 25, 1976) well defined. A model is presented of bacterial distribution. Also, historical data regarding the level of waterborne disease by community size are considered. (See also W79-10127) (Small-FRC)
W79-10132

CHLORINE RESIDUAL SUBSTITUTION - RATIONALE,
Health Effects Research Lab. Cincinnati, OH.
L. J. McCabe.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 57-63. 1978. 1 fig, 3 tab, 6 ref.

Descriptors: *Chlorination, *Water treatment, *Performance, *Toxicity, Public health, Treatment facilities.

The advantages and disadvantages of the chlorine residual are discussed. The absence of a residual can immediately signal inadequacy of water treatment or the introduction of foreign material, but the adverse effects of chloroform ingestion or the consumption of chlorinated water is known. Studies which demonstrate the usefulness of the chlorine residual are reviewed. Chlorine substitution is usable for smaller water systems, but for larger systems, the chlorine residual should be permitted. (See also W79-10127) (Small-FRC)
W79-10133

PUBLIC HEALTH CONSIDERATIONS OF THE MICROBIOLOGY OF POTABLE WATER,
Maryland Univ., College Park. Dept. of Microbiology.
R. R. Colwell, B. Austin, and L. Wan.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 65-75, 1978. 2 tab, 32 ref.

Descriptors: *Analytical techniques, *Coliforms, *Microbiology, *Potable water, Regulation, Pathogenic bacteria, Pseudomonas, Public health.

The advantages of microbial analysis over the use of the chlorine residual are discussed. The microbiology of potable water is reviewed, and the monitoring of microbial flora at the water source and during water treatment, storage, and distribution is recommended. Present microbial methods should be examined including blood agar and low nutrient media, pretreatment at low temperatures, and use of a wide range of incubation temperatures, and use of a wide range of incubation temperatures (especially 20-25 C) for the enumeration of total viable bacterial populations. Psychrophiles, mesophiles, and thermophiles should be considered because of the variety of conditions and uses of potable water. The presence of Flavobacterium and Pseudomonas are undesirable and methods for their detection and removal need development. (See also W79-10127) (Small-FRC)
W79-10134

SAMPLING COLLECTION AND HANDLING,
National Environmental Research Center, Cincinnati, OH. Water Supply Research Lab.
H. D. Nash.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 79-83. 1978. 1 tab, 13 ref.

Descriptors: *Sampling, *Potable water, *Aquatic bacteria, *Optimization, Water analysis, Public health, Regulation.

Proper water sample collection and handling, which are essential to obtain reliable results, are reviewed. Factors which influence the growth of bacterial flora during sample transit include quality of the sample bottle, the bacterial population, density of each type comprising the bacterial population, concentrations of organic and inorganic nutrients, fluctuations in temperature during transit, turbidity, clumping, and antagonistic action. The American Public Health Association 1975 Standard Methods are reviewed. Studies are reviewed relating to transit/storage time of samples. Research dealing with only potable water samples is needed to compile definative data. Presently, potable water samples must be processed within 30 hours after collection or data may not be valid. (See also W79-10127) (Small-FRC)
W79-10135

THE EPA METHODS MANUAL AND THE MICROBIOLOGICAL STANDARDS,
Environmental Monitoring and Support Lab., Cincinnati, OH.
R. H. Bordner, and J. A. Winter.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 85-90, 1978. 1 tab, 6 ref.

Descriptors: *Monitoring, *Analytical methods, *Regulation, Microbiology, Water treatment, Potable water.

A preview is presented of the EPA manual Microbiological Methods for Monitoring the Environment, Part 1 Water and Wastes. The manual meets the specific needs and legal requirements of the Agency to standardize methods used in enforcement, compliance monitoring, ambient monitoring, and research programs. The microbiological methods included represent the best available in the view of the EPA microbiologists. The manual is loose-leaf style which permits easy updating, and new editions are planned to keep the manual current. It is written in a simple, direct style and provides step-by-step instructions. (See also W79-10127) (Small-FRC)
W79-10136

EVALUATION OF STANDARD PROCEDURES: STANDARD METHODS,
California State Dept. of Health, Berkeley.
A. E. Greenberg.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 91-93, 1978.

Descriptors: *Analytical techniques, *Aquatic bacteria, *Coliforms, *Pathogenic bacteria, Publications, Water quality, Streptococcus, Regulation.

An evaluation is presented of the manual called Standard Methods for the Examination of Water and Wastewater. The current edition contains 131 pages on the bacteriological examination of water and waste water. Emphasis is on fecal organisms such as coliforms or streptococci determined by multiple tube dilution or membranes filtration. Small sections are devoted specifically to the detection of certain pathogens. Tentative procedures are included for viruses in water, Staphylococcus and Pseudomonas aeruginosa in swimming pools, yeasts, fungi, actinomycets, and nematodes. A section is included on the determination of iron and sulfur bacteria. It is recommended that the book be adopted as the sole methods source with unacceptable methods excluded by page or section citations in EPA regulations. (See also W79-10127) (Small-FRC)
W79-10137

VIRUS DETECTION,
Wisconsin Univ.-Madison. Food Research Inst.
D. O. Cliver.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C, p95-99, 1978. 1 fig, 14 ref.

Descriptors: *Viruses, *Potable water, *Analytical techniques, *Bioindicators, Water treatment, Turbidity, Aquatic bacteria, Microorganisms.

Virus detection, as it relates to evaluation of the microbiological standards for drinking water, is discussed. A tentative standard method for detecting viruses in drinking water exists, and the method has recovered experimentally-innoculated viruses efficiently from large-volume samples of water. No viruses have been detected in community water supplies using this method. Indicators of viruses could include fecal contaminants, turbidity, coliphages, and vaccine strains of human poliovirus. Presently, it is impossible to demonstrate that a community's water is virus-free. Protection from virus disease probably lies in detecting lapses in treatment practices or distribution. (See also W79-10127) (Small-FRC)
W79-10138

DISINFECTANT RESISTANT ORGANISMS,
Carborundum Co., Niagara Falls, NY.
P. T. B. Shaffer.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 101-102, 1978. 1 tab, 4 ref.

Descriptors: *Chlorination, *Viruses, *Variability, *Standards, Regulation, Potable water, Public health, Laboratory techniques.

Variations in resistance to chlorine inactivation among various strains of virus or among individual numbers of a specific virus strain, are discussed. The assumption that all viruses will exhibit the same die-off rates as laboratory strains is not technically sound. Two isolates recovered from well-treated finished water were subjected to chlorine inactivation, and their inactivation rates were compared with LSc and Mahoney poliovirus strains. The isolates showed chlorine inactivation rates orders of magnitude lower than that of either of the two standard controls. Thus, replacement of a direct standard with an indirect standard of turbidity or chlorine residual would not be sound based on these experiments. (See also W79-10127) (Small-FRC)
W79-10139

THE RELATIONSHIP OF TUBIDITY TO DISINFECTION OF POTABLE WATER,
National Environmental REsearch Center, Cincinnati, OH. Water Supply Research Lab.
J. C. Hoff.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C, p 103-117, 1978.

Descriptors: *Water treatment, *Turbidity, *Disinfection, *Potable water, Suspended solids, Carbon, Nitrogen, Coliforms.

The significance of turbidity as it relates to disinfection efficiency during water treatment is discussed, and possible problems encountered when using turbidity as a contaminant limit, are also discussed. Turbidity is not the ideal indicator of the disinfectability of potable water as this type of turbidity is more important than the amount. Biological data indicate similar disinfection curves at turbidities of 5 and 1. Parameters that should possibly be considered in addition to turbidity include total organic carbon or nitrogen in the suspended solid. Further consideration of the relevance of coliforms as indicators of viral safety is recommended. (See also W79-10127) (Small-FRC)
W79-10140

WASTEWATER REUSE AND THE PROBLEMS OF WATER-BORNE DISEASE,
Texas A and M Univ., College Station. Environmental Engineering Div.
H. W. Wolf.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 119-123, 1978. 12 ref.

Descriptors: *Disinfection, *Recycling, *Pathogenic bacteria, *Standards, Coliforms, Viruses, Turbidity, Water quality.

The disinfection of waste water to be reused must destroy bacteria, fungi and yeasts, rickettsia, viruses, protozoans, and helminths and flukes. For disinfection to be successful, drug-resistant bacteria should be determined by periodic surveys and existing coliform standards should be strickly enforced. Special attention should be paid to factors such as turbidity which interfere with the control of viruses. Also, coliphage determinations are useful, as it the disinfection process is working properly, there should be no viable coliphage in the finished water. Basic studies of water quality and organism growth in distribution systems, combined with monitoring efforts can be used to control pseudomonads. (See also W79-10127) (Small-FRC)
W79-10141

EVALUATION OF MICROBIOLOGICAL STANDARDS FOR DRINKING WATER, ENGINEERING CONTROL PRACTICES,
Black and Veatch, Kansas City, MO.
P. D. Haney.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 125-141, 1978. 3 fig, 1 tab, 9 ref.

Descriptors: *Potable water, *Sanitary engineering, *Standards, Water quality, Viruses, Chlorination, Design, Management, Monitoring, Turbidity.

Engineering control practices required by potable water standards on microbiological water quality are discussed. Past Public Health Service and present EPA standards are summarized. Problems which small utilities may face in implementing standards are discussed, and common problems with water distribution systems are reviewed. The possibility of required monitoring for viruses and future standards for halogenated compounds are discussed, and their impacts on engineering practices are considered. The current standards are proven and can be met by sound design and good management practices, but meeting future turbidity and virus monitoring requirements will cost more. (See also W79-10127) (Small-FRC)
W79-10142

COMPLIANCE WITH DRINKING WATER REGULATIONS,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
C. W. Hendricks.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 145-152, 1978. 2 tab, 5 ref.

Descriptors: *Regulation, *Analytical techniques, *Coliforms, *Standards, Water quality, Water treatment, Public health, Sampling.

The requirements of the Safe Drinking Water Act and the Interim Primary Drinking Water Regulations are summarized. Maximum microbiological contamination levels determined by the membrane filter technique and the fermentation tube technique are presented, as are microbiological contaminant sampling and analytical requirements. Problems with the Interim Primary Regulations are discussed. The Maximum Contaminant Levels (MCL) for membrane filter analytical methods do not resolve the question of low many coliform bacteria are assumed present in a single, highly contaminated sample. Also, a method must be developed for dealing with spurious positive results. Finally, the relationship between monthly averages of coliforms and monthly percentages of positive samples needs investigation. (See also W79-10127) (Small-FRC)
W79-10143

IMPLEMENTATION OF THE COLIFORM STANDARD BY A COMMUNITY WATER UTILITY,
Indianapolis Water Co., IN.
R. J. Becker.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 169-180, 1978. 2 fig, 8 tab.

Descriptors: *Treatment facilities, *Standards, *Coliforms, *Sampling, Public health, Legislation, Water treatment, Potable water.

The implementation of the coliform standard by the Indianapolis Water Company is discussed. Treatment facilities, seasonal treatment operations, and sampling procedures are outlined. The bacteriological results of the treatment plant effluent and distribution system samples over a 50 year period are presented. Problems that this water company finds with the requirements of the Safe Drinking Water Act include: the requirement that the public be notified of a hazard based on an erroneous test result, and the fact that utilities are responsible for providing safe water at the tap when they have no control over residential plumbing. (See also W79-10127) (Small-FRC)
W79-10146

COMPLIANCE WITH PL 93-523 COLIFORM STANDARDS,
California State Dept. of Public Health, Berkeley.
H. J. Ongerth.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 181-188, 1978.

Descriptors: *Coliforms, *Standards, *California, *Treatment facilities, *Regulation, Water treatment, Potable water, Public health.

The development of certain aspects of the coliform standards are reviewed, and California's compliance program is discussed. First, the report of the advisory committee which recommended the 1925 Treasury Department standards for drinking water is discussed. Second, the monitoring-compliance program in California is described, beginning with the creation of the Bureau of Sanitary Engineering in 1915. The first state-wide comprehensive sanitary engineering survey of community systems was made in 1930. In the early sixties a program was initiated to require compliance with frequency sampling standards, requirements which were often being ignored by smaller systems. In 1968, about 30% of the water systems failed to meet the coliform standard for one or more months. Reasons for failure to meet standards by some systems in 1976 are discussed. The current standards are stringent but attainable. (See also W79-10127) (Small-FRC)
W79-10147

CANADIAN DRINKING WATER STANDARDS,
British Columbia Dept. of Health, Vancouver.
T. P. Subrahmanyan, D. A. Schiemann, A. J. Rhodes, J. Henderson, and E. Bowmer.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 189-194, 1978.

Descriptors: *Canada, *Standards, *Regulation, Potable water, Public health, Legislation.

The development of Canadian Drinking Water Standards is reviewed beginning with a standard of bacteriological quality passed in 1923 to the 1968 Canadian Drinking Water Standards. Recent recommendations for standards are summarized and compared with similar U.S. standards. The revision process in the U.S. is currently more advanced than in Canada. Also, Canadian standards only provide guidelines for regulatory agencies, although this will change if the new recommendations are adopted. (See also W79-10127) (Small-FRC)
W79-10148

ALTERNATIVE MEANS OF DETERMINING COMPLIANCE,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
S. M. Morrison.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 197-198, 1978.

Descriptors: *Standards, *Enforcement, *Coliforms, *Sampling, Potable water, Water treatment, Statistical analysis.

Effective, economical methods for determining compliance which can be applied to small public water systems are now in demand. Several alternatives are briefly presented and discussed. First, volume treated or volume delivered for domestic use could be used to determine required number of tests. Second, a system using a 30, 60, or 90 day running average would better indicate deteriorating water systems. Third, a procedure allowing retesting for three days after a high coliform test would eliminate possible sampling and compliance errors. Fourth, proper statistical design of sampling programs is urged. Also, the concept of public notification is discussed. (See also W79-10127) (Small-FRC)
W79-10149

THE COLIFORM MCL: CAN WE DEFEND IT.
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
W. Litshy.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 199-204, 1978. 2 tab, 17 ref.

Descriptors: *Coliforms, *Chlorination, *Standards, *Statistical analysis, Potable water, Public health.

Aspects of the coliform Maximum Contaminant Level are discussed. The substitution of the chlorine residual for the coliform standard is opposed. The multiple tube technique is proposed as the sole measurement method. Data are presented on sewage effluent which demonstrate that there can be fecal coliforms in water showing a high chlorine residual. Problems with calculation of the Most Probable Number (MPN) for coliforms as outlined in Standard Methods, are outlined. Data demonstrating poor replication of the MPN technique are presented, and the statistics upon which the MPN technique is based are discussed. (See also W79-10127) (Small-FRC)
W79-10150

ALTERNATIVE MEANS OF DETERMINING COMPLIANCE,
Illinois State Dept. of Public Health, Springfield. Div. of Labs.
B. E. Gay.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 205-209, 1978. 5 ref.

Descriptors: *Regulations, *Coliforms, *Sampling, Water treatment, Potable water, Public health.

Problems with determining compliance of water systems with government controls are discussed. Regulations are suggested which would define the qualifications and responsibilities of water sample collectors. Also, similar regulations are urged for small and large community systems, and four samples per month are proposed. Certification of water laboratories is also discussed. The substitution of the chlorine residual for bacteriological testing is opposed. (See also W79-10127) (Small-FRC)
W79-10151

ALTERNATIVE MEANS OF DETERMINING COMPLIANCE,
Illinois Environmental Protection Agency, Springfield. Div. of Public Water Supplies.
Ira Markwood.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 211-214, 1978.

Descriptors: *Standards, *Regulation, *Potable water, *Coliforms, Public health, Water treatment.

Changes in potable water compliance requirements are suggested. First, a running time period for sample collection is proposed rather than the calendar month. Compliance of small systems which are often poor and inadequately operated, is discussed. Because the results of the coliform test can be interpreted in different ways, problems are experienced with the test, especially in small systems. Problems with enforcement are also briefly considered. (See also W79-10127) (Small-FRC)
W79-10152

ALTERNATIVE MEANS OF DETERMINING COMPLIANCE,
Drexel Univ., Philadelphia, PA. Dept. of Biological Science.
W. O. Pipes.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 215-218, 1978. 7 ref.

Descriptors: *Standards, *Coliforms, *Statistical analysis, Potable water, Water treatment, Public health.

Problems associated with establishing microbiological standards for drinking water are discussed. Regulations written in terms of monthly averages do not make the point that no coliforms should be present in treated water or added during distribution; positive results are not acceptable. The Most Probable Number (MPN) concept is discussed, and it is suggested that the MPN should correctly be called the maximum likelihood estimator of the mean coliform density after the work of R. A. Fisher. Better data is needed in order to develop powerful statistical models. (See also W79-10127) (Small-FRC)
W79-10153

ALTERNATE MEANS OF MEASURING COMPLIANCE WITH BACTERIOLOGIC STANDARDS OF PUBLIC WATER SUPPLIES,
New York State Dept. of Health, Albany. Environmental Health Center.
G. W. Fuhs.
In: Evaluation of the Microbiology Standards for Drinking Water, Report EPA-570/9-78-00C. p 219-227, 1978. 27 fig, 1 ref.

Descriptors: *Standards, *Statistical analysis, *Pathogenic bacteria, *Water treatment, Public health, Regulations, Coliforms.

The relationship between bacteriological standards for water supplies and public health risk is examined in terms of the laws of large and small numbers. In areas with large populations, the probability of ingesting an infectious dose is calculated from the probability of ingesting a certain number of viable infectious particles and the probability of infection from such a particle. When the population is small, the ratio of pathogens to indicator bacteria is subject to wide fluctuations depending on the presence or absence of excretus in the watershed. The relationship between these considerations and the establishment of regulations is discussed. (See also W79-10127) (Small-FRC)
W79-10154

WATER PURIFICATION SYSTEM,
L. W. Malik.
U.S. Patent No. 4,151,085, 8 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1390, April 24, 1979.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtering, Flow control, Microorganisms, Filters, Equipment.

A water purification system has a pre-filter, a series of germicidal radiation chamber filter units alternating with a series of mechanical filter units and it has a flow measuring device fixed to the output part of the final mechanical filtering unit. The rate of flow through the series of alternating germicidal and mechanical filtering units is measured by the flow measuring device and in turn controlled by an electrically operated valve so as to keep the rate of flow at some predetermined and optimal setting with respect to the efficaciousness of the germicidal filters. (Sinha-OEIS)
W79-10217

WATER TREATMENT FOR SMALL PUBLIC SUPPLIES, REPORT OF OPERATION: CUBA, CARRIZOZO, LA LUZ, SAN YSIDRO, BLUEWATER, MORIARTY, HAGERMAN,
New Mexico State Univ., Las Cruces. Dept. of Chemical Engineering.
H. G. Folster, D. B. Wilson, G. Kramer, S. Hanson, and R. Duran.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-301 051, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute Report No. 107, July 1979, 91 p, 11 fig, 33 tab, 5 ref, 2 append. OWRT T-0009-C-90016-T(7515)(2), 14-34-0001-7515.

Descriptors: *Reverse osmosis, *Electrodialysis, Water quality standards, Water treatment, Cuba(New Mexico), Carrizizo(New Mexico), La Luz(New Mexico), San Ysidro(New Mexico), Bluewater(New Mexico), Moriarty(New Mexico), Hagerman(New Mexico), San Jon(New Mexico).

The major objective was the demonstration of technology development for desalination being successfully applied to bring domestic water supplies into compliance with the National Drinking Water standards. A mobile unit containing the necessary pretreatment and post-treatment equipment to support reverse osmosis and electrodialysis as primary units was assembled. This equipment is described in WRRI Report No. 095, June 1978. (See W78-11208). During the late fall of 1977 and all of 1978 the mobile demonstration unit was operating in eight New Mexico communities: Cuba (pop. 1200), Carrizozo (pop. 1250), La Luz (pop. 2500), Moriarty (pop. 1750), San Ysidro (pop. 250), Bluewater (pop. 2500), San Jon (pop. 300), and Hagerman (pop. 750). This report details the operating experience and the performance data in the two systems - reverse osmosis and electrodialysis. The appropriate standards of the National Drinking Water Act were met in all communities.
W79-10237

HYDROBIOLOGICAL AND CHEMICAL RESPONSE TO THE ADDITION OF IRON AND ALUMINUM SALTS, STUDIED IN THREE LUND-TYPE BUTYLRUBBER RESERVOIRS,
Koudekerk a/d Rijn (The Netherlands).
For primary bibliographic entry see Field 5A.
W79-10280

5G. Water Quality Control

TECHNOLOGICAL RESPONSE TO SPILLS OF HAZARDOUS SUBSTANCES,
National Science Foundation, Washington, DC. Div. of Advanced Environmental Research and Technology.
For primary bibliographic entry see Field 5D.
W79-10119

OILY-WATER SEPARATOR,
J. Sakaguchi.
U.S. Patent No. 4,151,087, 5 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1391, April 24, 1979.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water quality control, Water pollution treatment, Separation techniques, Filtration, Equipment, Ballast water.

A compact oily-water separator for applications as on board ships where space is restricted, uses a single vessel which can perform the functions to be performed in three different vessels located separately. According to the invention, the single vessel of up-stand type has a partition wall which divides the interior of the single vessel into two chambers. A cylindrical filter device is supported by the partition wall so that the upper portion of the filter device is located in the upper chamber and a lower portion of the device is in the lower chamber. The upper chamber is provided with an oil-water mixture inlet and a first oil outlet, respectively and the lower chamber is provided with a third oil outlet and a water outlet. A second oil outlet is connected to the top of the filter device. (Sinha-OEIS)
W79-10164

FLUID SAMPLE COLLECTION AND DISTRIBUTION SYSTEM,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
For primary bibliographic entry see Field 1A.
W79-10167

WATER PURIFICATION SYSTEM,
For primary bibliographic entry see Field 5F.
W79-10217

PROCESS AND PLANT FOR HYDROMECHANICAL RECOVERY OF A FLUID SPREAD IN A THIN LAYER ON THE SURFACE OF ANOTHER LIQUID,
Seaclean S.A. (Luxembourg). (Assignee).
P. Bolli, and J-J. Asper.
U.S. Patent No. 4,151,081, 14 p, 19 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1388-1389, April 24, 1979.

Descriptors: *Patents, *Oil spills, *Water pollution treatment, *Water quality control, Oil pollution, Skimming, Equipment, Thin films, Oil recovery.

A hydromechanical skimming process works both mechanically and hydrodynamically and is suitable for treating both large contaminated surfaces such as out at sea or in ports, and relatively small contaminated surfaces such as in purification plants. The process comprises the steps of partitioning off at least one portion of the liquid and superimposed fluid up to a depth exceeding the interface between them, reducing the area of the partitioned portion to increase the thickness of the layer of fluid, and recovering at least the major portion of the thickened layer of fluid. The invention also provides a plant for carrying out the process. (Sinha-OEIS)
W79-10224

REMOVING OIL FROM WATER,
Dow Chemical Co., Midland, MI. (Assignee).
D. W. Calvin.
U.S. Patent No. 4,151,078, 3 p, 6 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1387-1388, April 24, 1979.

Descriptors: *Patents, *Oil pollution, *Water quality control, Separation techniques, Adsorption, Silica, Oil recovery, Hydrophobic silica.

Hydrophobic silica, containing sorbed HF values, is used to remove oil from water by sorption of the oil onto the silica and then separating the oil/silica mixture from the water. Furthermore, the invention pertains to recovering the silica from the oil by aqueous treatment in such a manner that the hydrophobicity of the silica is overcome and the silica becomes hydrophilic, thereby releasing the oil. (Sinha-OEIS)
W79-10240

WINTER SPRAY IRRIGATION OF SECONDARY MUNICIPAL EFFLUENT,
Michigan Dept. of Public Health, Lansing.
For primary bibliographic entry see Field 5D.
W79-10257

HYDROBIOLOGICAL AND CHEMICAL RESPONSE TO THE ADDITION OF IRON AND ALUMINUM SALTS, STUDIED IN THREE LUND-TYPE BUTYLRUBBER RESERVOIRS,
Koudekerk a/d Rijn (The Netherlands).
For primary bibliographic entry see Field 5A.
W79-10280

HORIZONTAL SEPARATOR,
F. N. Harris.
U.S. Patent No. 4,149,973, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 1019, April 17, 1979.

Descriptors: *Patents, *Oil pollution, *Separation techniques, Water pollution treatment, Water quality control, Equipment, Filtration, Gravity separation.

An oil-water mixture is introduced into a horizontal trough which is in a container and has baffles directing flow upwardly toward an opening in the container to a trap on the top of the container. Oil separates from the water as it flows along the baffles and moves by gravity separation up into the trap. In interface sensor in the trap opens an oil outlet from the trap whenever a sufficient quantity of oil accumulates. The water flows down from the upper part of the container through a coalescing filter to a water outlet located in the lower part of the container, being a three-stage separator. (Sinha-OEIS)
W79-10291

PROCESS AND COMPOSITION FOR INHIBITING CORROSION OF METAL PARTS IN WATER SYSTEMS,
AMAX Inc., Greenwich, CT. (Assignee).
D. R. Robitaille, and M. S. Vukasovich.
U.S. Patent No. 4,149,969, 5 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 3, p 1017-1018, April 17, 1979.

Descriptors: *Patents, *Water treatment, *Scaling, *Corrosion, Water quality control, Industrial water, Organic compounds, Cooling water, Alkali metals.

A process and a composition is described for inhibiting corrosion of metal parts in water systems such

as in recirculating cooling towers and the like, while additionally suppressing scale formation and inhibiting corrosion of copper and copper-containing alloys. A controlled combination of active constituents in effective amounts are added and dissolved. They are: an alkali molybdate salt, a divalent metal cation selected from the group consisting of ZN++, Mn++ and Ni++; 1-hydroxyethylidene-1, 1-diphosphonic acid and the aqueous soluble alkali salts thereof; and an organic agent selected from the group consisting of 2-mercaptobenzothiazole and the alkali salts thereof; 1,2,3-benzotriazole, and tolytriazole. (Sinha-OEIS)
W79-10323

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES, PHASE II, FINAL REPORT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
J. W. Delleur, J. M. Bell, W. N. Melhorn, W. L. Miller, and H. R. Potter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 833, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 112, August 1979. 112 p, 38 fig, 24 tab, 2 append. OWRT C-6106(5213)(i1).

Descriptors: *Urban drainage, *Planning, *Methodology, *City planning, Urban runoff, Storm runoff, Systems analysis, Simulation analysis, Storm drains, Detention reservoirs, Storage, Groundwater availability, ILLUDAS, Public participation, Aesthetic values.

The principal objective was the development of methodologies in comprehensive planning of water resources of medium size communities and in extending the planning to a 25 to 30 year horizon. The approach was that of systems analysis involving interaction between several research disciplines and with community groups. The disciplines represented in the research were sociology, geology, surface and groundwater hydrology, water quality, economics, and land use planning. The project was divided into two phases. The first phase was reported in Purdue University Water Resources Research Center Technical Report No. 74, April 1976 (See W76-11175) which addressed the methodologies of models for estimating population growth, water demand, quantity and quality of surface runoff and availability of groundwater sufficient to supply increasing demand and for determining economic trade-offs between alternate drainage systems. In this second phase some of the models of Phase I were extended or coordinated. A simpler groundwater model was developed and new causal stochastic models of the groundwater levels were tested. Existing models for the planning and design of urban runoff quantity and quality were extended and improved. Probabilistic and statistical analyses of the urban runoff quantity and quality were performed. These model improvements and these analyses made it possible to design alternative urban drainage systems with several degrees of storage detention and pollution treatment. These several systems were then evaluated for their direct and indirect economic and environmental impacts on the community. Also evaluated was the acceptability of community policies on drainage, land use, urban growth and environmental quality by community leaders and by the general public. (Wiersma-Purdue)
W79-10081

PLAN OF STUDY FOR THE NORTHERN GREAT PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS IN PARTS OF MONTANA, NORTH DAKOTA, SOUTH DAKOTA, AND WYOMING,
Geological Survey, Lakewood, CO. Water Resources Div.
G. A. Dinwiddie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-298 141, Price codes: A02 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 79-34, March 1979. 20 p, 2 fig.

Descriptors: *Project planning, *Groundwater resources, *Water supply, *Aquifer management, *Great Plains, Montana, North Dakota, South Dakota, Wyoming, Water resources development, Optimum development plans, Systems analysis.

The Northern Great Plains, an area of about 250,000 square miles in parts of Montana, North Dakota, South Dakota, and Wyoming, is underlain by an accumulation of sediments eroded from the Black Hills and from mountains to the west. Principal aquifers are areally extensive beds of sandstone within these sedimentary rocks, some at great depths. Anticipated future water needs dictate that available ground-water supplies be evaluated for management of this natural resource. The U.S. Geological Survey has started (1978) a 4-year study of the Northern Great Plains aquifer system. The objective of this study is to define availability and quality of ground water and to predict the effects of using this resource. To achieve this objective, the ground-water system will be described in terms of spatial distribution, hydraulics, geology, and geochemistry. Once described, the groundwater system will be simulated by mathematical models that will be used to define responses of the system to various management alternatives and assumed development patterns. This initial report describes the framework for the study. (Woodard-USGS)
W79-10171

CONFLICT MANAGEMENT IN FEDERAL WATER RESOURCE PLANNING,
Colorado Univ., Boulder. Inst. of Behavioral Science.
W. B. Lord, L. Adelman, P. Wehr, C. Brown, and R. Crews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-300 919, Price codes: A06 in paper copy, A01 in microfiche. Program on Technology, Environment and Manm, Monograph No. 28, 1979. 114 p, 4 fig, 2 tab, 76 ref. OWRT C-7700(7258)(1). 14-34-0001-7258.

Descriptors: *Conflicts, *Project planning, *Political constraints, *Decision making, *Political aspects, Methodology, Social participation, Compromise, Institutional constraints, Formulation, Social aspects, Water policy, Institutions, Evaluation, *Conflict resolution, *Alternatives, Multiobjective planning.

Federal water resource planning has become increasingly conflict-ridden, problematical, and costly. The research reported was aimed at analyzing the nature of that conflict, and at designing and testing a conflict management strategy. Conflict may be due to cognitive differences, to differences over social values, and/or to differences between affected interest groups over the distribution of benefits and costs. Often all three types of conflict will occur. An appropriate conflict management strategy should lead to the identification of conflict elements and assist in problem definition. It should include procedures for reducing cognitive differences, encouraging value convergence, and facilitating bargaining between contending interests. A conflict management intervention employing this strategy failed, however, because the institutional setting of Federal water resource planning was incompatible with its application. The dominant political mode within which such planning occurs encourages early commitment to narrowly conceived alternatives and too often forecloses consideration of broader or rival values and of the wider range of alternatives around which bargaining could occur. However, the trust of emerging procedures and guidelines for Federal water resource planning is rational-analytic and thus compatible with the conflict management strategy suggested herein.
W79-10236

6B. Evaluation Process

CONFLICT MANAGEMENT IN FEDERAL WATER RESOURCE PLANNING,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6A.
W79-10236

6E. Water Law and Institutions

EXPERIENCES WITH THE COLIFORM STANDARD UNDER THE INTERSTATE CARRIER PROGRAM,
Environmental Protection Agency, Boston, MA. Water Supply Branch.
For primary bibliographic entry see Field 7B.
W79-10144

INSTITUTIONAL ARRANGEMENTS FOR INTRASTATE GROUNDWATER MANAGEMENT: A COMPARATIVE ASSESSMENT USING VIRGINIA AS A CASE STUDY,
JBF Scientific Corp., Arlington, VA.
For primary bibliographic entry see Field 4B.
W79-10235

CONFLICT MANAGEMENT IN FEDERAL WATER RESOURCE PLANNING,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6A.
W79-10236

GROUND WATER RESOURCES OF GEORGIA,
Georgia Univ., Athens. Inst. of Government.
For primary bibliographic entry see Field 2F.
W79-10241

6F. Nonstructural Alternatives

INSTITUTIONAL ARRANGEMENTS FOR INTRASTATE GROUNDWATER MANAGEMENT: A COMPARATIVE ASSESSMENT USING VIRGINIA AS A CASE STUDY,
JBF Scientific Corp., Arlington, VA.
For primary bibliographic entry see Field 4B.
W79-10235

6G. Ecologic Impact Of Water Development

ECOREGIONS OF THE UNITED STATES,
Intermountain Forest and Range Experiment Station, Ogden, UT.
For primary bibliographic entry see Field 7C.
W79-10242

7. RESOURCES DATA

7A. Network Design

AN OVERVIEW OF THE U.S. GEOLOGICAL SURVEY'S QUALITY-ASSURANCE PROGRAM FOR WATER QUALITY,
Geological Survey, Denver, CO. Water Resources Div.
B. A. Malo.
In: Quality Assurance in Air Pollution Measurement, Proceedings of Air Pollution Control Association Specialty Conference, New Orleans, Louisiana, p 70-74, March 11-14, 1979. 3 ref.

Descriptors: *Water quality, *Programs, *Analytical techniques, *Water analysis, *Reviews, Data collections, Network design, Sampling, Chemical analysis, Laboratory tests, Training, *U.S. Geological Survey, *Data quality assurance.

National hydrologic data needs served by the U.S. Geological Survey, Water Resources Division,

have increased and diversified. The advent of national data storage and retrieval systems with data inputs from varied and different sources necessitates assurance of comparability, precision, and accuracy of data by all data producers. To assure high quality of water-quality data resulting from Water Resources Division activities an extensive program has evolved. This program addresses the areas of field data collection, materials testing, and laboratory analyses. Quality assurance of field activities depends on technicians and professionals trained in data collection and sampling techniques, and on regular review of field activities by experienced, senior personnel. Quality assurance support to the field is provided by a materials testing project that provides standardized materials for evaluation of field instrumentation, supplies, and techniques. The quality assurance program for laboratories covers not only Water Resources Division facilities, but other analytical laboratories that furnish data to the Division. Active programs include laboratory evaluations, preparation and use of reference materials, and independent review of analytical data. (Woodard-USGS)
W79-10163

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY NEW MEXICO DISTRICT, FISCAL YEAR 1978,
Geological Survey, Albuquerque, NM. Water Resources Div.
P. L. Soule, and D. W. Wilkins.
Geological Survey open-file report 79-560, March 1979. 84 p, 29 fig.

Descriptors: *Water resources, *New Mexico, *Projects, *Data collections, Surface waters, Groundwater, Network design, Available water, Water quality, Publications, Programs, *US Geological Survey.

This is the first of an annual series of reports in which the program of the New Mexico District, U.S. Geological Survey, Water Resources Division, will be summarized. This report, which is for fiscal year 1978, should be useful to cooperating agencies and to the users of water data in that it summarizes and gives the status of the basic data collection program and all current studies of the Water Resources Division in New Mexico. The water-resource programs of the District are composed of surface water, ground water, and water quality disciplines. As of April 1978 the District had 36 active projects, 30 reports for release, and answered about 5,000 requests for water related information. (Woodard-USGS)
W79-10177

7B. Data Acquisition

SAMPLING METHODOLOGIES FOR ASSESSING RURAL RUNOFF,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W79-10121

PROBABILITY SAMPLING OF SMALL STREAMS: PROBLEMS AND RESULTS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
D. W. Hayne.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 809-830, 1977. 2 fig, 4 tab, 5 ref. EPA R803328.

Descriptors: *Sampling, *Probability, *Statistics, *Model studies, Mathematical models, Statistical models, Flow, Streamflow, Runoff, Drainage, Rivers, Watersheds(Basins), Pollutants, Chemicals, Data collections, Water quality, Nitrogen, Phosphorus, Costs, Planning, Optimization, Hydrology, *Chowan River Basin(VA-NC).

Sampling methods are required in any large-scale study were it is impractical to cover the whole universe under investigation. This status certainly describes any attempt to characterize the small drainages that constitute the main sources of runoff in a river basin. Briefly, the advantages of probability sampling are that it eliminates the inevitable personal bias of judgement sampling, provides a statistical basis for inference and estimation of precision, and is absolutely reproducible as to method (not results) by other investigators. Judgement sampling lacks these characteristics. The objective of this study was to determine the feasibility of applying probability sampling to the study of the total number of small drainage basins that make up a river basin. (See also W79-10107) (Sims-ISWS)
W79-10122

EXPERIENCES WITH THE COLIFORM STANDARD UNDER THE INTERSTATE CARRIER PROGRAM,
Environmental Protection Agency, Boston, MA. Water Supply Branch.
F. Taylor.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 153-157, 1978. 7 ref.

Descriptors: *Water sampling, *Analytical techniques, *Water quality control, *Potable water, *Water quality standards, Testing procedures, Monitoring, Coliforms, Interstate, Testing.

The development of the coliform standard under the interstate carrier certification program is reviewed. The original 1914 standard limited the detection of Bacillus coli to one out of five 10 cc portions of any sample. The 1942 and 1946 Public Health Service Drinking Water Standards required number of samples, standard portions, and standard samples. In 1971 the Interstate Carrier Water Supply Program came under the control of EPA. Carrier water quality had to meet all the limits of sections 3.2 and 3.1 of the 1962 standards. These systemized requirements resulted in improvements in reporting, upgrading or monitoring frequency, and improvements in plants and operations. (See also W79-10127) (Small-FRC)
W79-10144

EXPERIENCES WITH THE COLIFORM STANDARD,
Environmental Protection Agency, Chicago, IL.
J. Harrison.
In: Evaluation of the Microbiology Standards for Drinking Water. Report EPA-570/9-78-00C. p 159-168. 1978. 1 tab.

Descriptors: *Coliforms, *Sampling, *Testing procedures, *Bioindicators, *Monitoring, Water quality control, Water quality standards, Testing, Water sampling.

Some typical experiences of public water systems in finding coliform bacteria, and how various state agencies and EPA regions have handled these findings, are reviewed. Case histories illustrating sampling errors, errors in bacteriological sampling techniques, and problems with the Maximum Contaminant Level standard, are presented. Two proposals for further changes in microbiological regulations are presented. These simplify the monitoring process by prohibiting the presence of any coliforms in a certain number of samples rather than by setting acceptable levles of coliforms for samples. (See also W79-10127) (Small-FRC)
W79-10145

THE USE OF A GAMMA LOGGER TO DELINEATE GLACIAL AND BEDROCK STRATIGRAPHY IN SOUTHWESTERN OHIO,
Miami Univ., Oxford, OH. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-10246

DECONTAMINATION OF WATER CONTAINING CHEMICAL WARFARE AGENTS,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5D.
W79-10330

7C. Evaluation, Processing and Publication

BASELINE LEVELS AND SEASONAL VARIATIONS OF ENTERIC BACTERIA IN OLIGOTROPHIC STREAMS,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5B.
W79-10111

ALGAL DIVERSITY AND TRANSPORT IN SMALL STREAMS,
North Carolina State Univ. at Raleigh. Inst. of Statistics.
For primary bibliographic entry see Field 5B.
W79-10113

BASIN SIZE, WATER FLOW AND LAND-USE EFFECTS ON FECAL COLIFORM POLLUTION FROM A RURAL WATERSHED,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-10114

SELECTED PATHOGENIC MICROORGANISMS CONTRIBUTED FROM URBAN WATERSHEDS,
Johns Hopkins Univ., Baltimore, MD. School of Hygiene and Public Health.
For primary bibliographic entry see Field 5B.
W79-10115

HYDROLOGIC DATA SOURCES,
Agricultural Research Center, Beltsville, MD. Hydrologic Data Lab.
J. B. Burford.
In: Watershed Research in Eastern North America, A Workshop to Compare Results, Volume II, February 28-March 3, 1977. Report No. NSF/RA-770255. Smithsonian Institute, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, p 909-924, 1977. 2 fig, 11 ref.

Descriptors: *Hydrologic data, *Basic data collections, *Data storage and retrieval, Meteorological data, Rainfall, Precipitation(Atmospheric), Streamflow, Temperature, Land use, Watersheds(Basins), Groundwater, Water quality, Climatic data, Hydrology, Data collections, Computers, Data sources.

Watershed modeling requires hydrologic data as input and for output comparison. The Agricultural Research Service hydrologic data bank, which includes data from several agricultural watershed research studies, is one data source. Other data banks include: Water Data Storage and Retrieval (WATSTORE); National Climatic Center Data Bank; Hydrologic Information Storage and Retrieval System (HISARS); Storage and Retrieval System (STORET); and the National Water Data Exchange (NAWDEX). Data are available from all of these sources at nominal costs. (See also W79-10107) (Sims-ISWS)
W79-10126

FRESHWATER USE IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
S. D. Leach.
Florida Bureau of Geology Map Series No. 87, 1978. 1 sheet, 7 fig, 5 ref.

Descriptors: *Florida, *Freshwater, *Water utilization, *Surface waters, *Groundwater, Maps, Water supply, Water demand, Municipal water, Irrigation water, Thermal powerplants, Industrial water, Domestic water, Consumptive use.

Total Florida freshwater uses in 1975 by county from surface- and ground-water sources for public supply, rural, irrigation, industrial, and thermoelectric power generation, are shown on a map. Freshwater use in 1975 was 6,918 Mgal/d compared to 5,768 Mgal/d in 1970. Public water supply demand

increased from 884 to 1,146 Mgal/d and rural (self-supplied) increased from 195 to 266 Mgal/d, both largely reflecting the increase in population from 6.8 to 8.5 million. Water used for irrigation showed the greatest increase, from 2,099 to 2,868 Mgal/d. Water used for industrial (self-supplied) and thermoelectric power generation remained relatively stable as industrial use increased from 926 to 940 Mgal/d and thermoelectric power generation decreased slightly from 1,700 to 1,698 Mgal/d. The statewide freshwater use is shown from source through use to disposition. For example, of the 1,146 Mgal/d used for public supply, 983 Mgal/d or 85.8 percent was ground water. Disposition of the public supply indicated that 48.9 percent was consumed, with the remaining 51.1 percent (586 Mgal/d) returned to the system for reuse. The major freshwater source for irrigation and thermoelectric power generation is surface water whereas ground water is the major source of water for public, rural, and industrial supplies. (Woodard-USGS)
W79-10173

ECOREGIONS OF THE UNITED STATES,
Intermountain Forest and Range Experiment Station, Ogden, UT.
R. G. Bailey.
1976. 1 fig, 2 tab, 20 ref, 1 map.

Descriptors: *Maps, *Land management, *United States, Ecosystems, Resources, Regions, Regional analysis, Mapping, Geographical regions, Classification, Environment, Ecology, *Ecoregions.

To manage land as heterogeneous as that the Forest Service deals with, we must be able to classify it as to its capability and availability to produce different goods and services. There are a number of different kinds of regions depending upon objective or purpose. Just as a region based on agriculture is an agricultural region, one based on ecosystems is an ecosystem region or ecoregion. To date, most work based on the ecosystem concept of resource management is at a detailed level. There are at least two reasons why a regional view of ecosystem is needed: (1) to permit detailed data to be aggregated into more generalized units for decisionmaking at higher levels; (2) to provide an integrating frame of reference needed to fully interpret the more detailed information. This map was developed to meet these needs. Maps based on classification of climatic types, vegetation associations, and soil groups have been widely used, but no comparable broad-scale synthesis of these maps has been commonly accepted. This map is an attempt to fill that gap. (Froehlich-ISWS)
W79-10242

ESTIMATION OF THE ISOTOPIC COMPOSITION OF LAKE EVAPORATE,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
G. B. Allison, R. M. Brown, and P. Fritz.
Journal of Hydrology, Vol. 42, No. 1/2, p 109-127, June 1979. 9 fig, 2 tab, 11 ref.

Descriptors: *Isotope studies, *Evaporation, *Evaporation pans, Lakes, Humidity, Estimating, Meteorological data, Temperature, Shores, *Ontario, *Isotopic composition, *Heavy-isotope concentration, *Chalk River, Lake evaporate, Isotope enrichment, Stable humidity, Meteorological conditions, Field conditions.

The use of evaporation pans for determining the isotope composition of water evaporating from a lake has been studied. It was found that useful values of the relevant parameters, the relative rate of isotope enrichment, and the heavy-isotope concentration attained as complete evaporation is approached could be obtained with the size of pan used only when evaporation had proceeded under stable humidity conditions until the pan was almost empty. In practice, meteorological conditions usually changed before this state was reached. One period of meteorologically stable conditions permitted field evaluation of the relative rate of isotope enrichment and the heavy-isotope concentration as complete evaporation approached zero. Comparison with values calculated from free air relative humidities and relative humidities normalized to the evaporating water temperature indicated that the former corresponded more closely to field-measured values. Due to limitations in the field measurements of the above under variable meteorological conditions, these parameters were calculated from the free air relative humidities to deduce day-to-day evaporation values from the isotope concentrations in the pans. (Roberts-ISWS)
W79-10267

8. ENGINEERING WORKS

8A. Structures

COUNTERMEASURES FOR HYDRAULIC PROBLEMS AT BRIDGES, VOLUME 1 - ANALYSIS AND ASSESSMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. C. Brice, and J. C. Blodgett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-297 132, Price codes: A09 in paper copy, A01 in microfiche. Federal Highway Administration report, FHWA-RD-78-162, September 1978. 169 p, 74 ref.

Descriptors: *Bridges, *Bridge design, *Bridge failure, *Scour, *Erosion control, River training, Geomorphology, Channel morphology, Flow around objects, Flood protection, Bank protection, Bank stability, United States, Canada.

Guidelines have been developed to assist design, maintenance, and construction engineers in selecting measures that can be used to reduce bridge losses attributable to scour and bank erosion. These guidelines are based on case histories of 224 bridge sites in the United States and Canada, on interviews with bridge engineers in 34 States, and on a survey of published work on countermeasures. Each case history (in Vol. 2) includes data on bridge, geomorphic, and flow factors; a chronological account of events; and an evaluation of hydraulic problems and countermeasures. Problems at piers occurred at 100 sites and problems at abutments, at 80 sites. Problems are attributed to local scour at 50 sites, to general scour at 55 sites, and to lateral stream erosion at 105 sites. Performance ratings are given for rigid and flexible revetment, for flow-control measures (spurs, dikes, spur dikes, check dams, jack fields), and for measures incorporated into the bridge. Streams are classified for engineering purposes into five major types, each having characteristics of lateral stability and behavior that need to be considered in the design of bridges and countermeasures. Hydraulic analysis was carried out for flood conditions at 60 bridges, for which values of flow, bridge, and geomorphic factors are tabulated. The report is in two volumes: Volume 1 - Analysis and Assessment; Volume 2 - Case Histories for Sites 1-283. (See also W79-10175) (Woodard-USGS)
W79-10174

COUNTERMEASURES FOR HYDRAULIC PROBLEMS AT BRIDGES, VOLUME 2 - CASE HISTORIES FOR SITES 1-283,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. C. Brice, and J. C. Blodgett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-297 685, Price codes: A24 in paper copy, A01 in microfiche. Federal Highway Administration report, FHWA-RD-78-163, September 1978. 542 p.

Descriptors: *Bridges, *Bridge design, *Bridge failure, *Scour, *Erosion control, River training, Geomorphology, Channel morphology, Flow around objects, Flood protection, Bank protection, Bank stability, United States, Canada.

Guidelines have been developed to assist design, maintenance, and construction engineers in selecting measures that can be used to reduce bridge losses attributable to scour and bank erosion. These guidelines are based on case histories of 224 bridge sites in the United States and Canada, on interviews with bridge engineers in 34 States, and on a survey of published work on countermeasures. Each case history (in Vol. 2) includes data on bridge, geomorphic, and flow factors; a chronological account of events; and an evaluation of hydraulic problems and countermeasures. Problems at piers occurred at 100 sites and problems at abutments, at 80 sites. Problems are attributed to local scour at 50 sites, to general scour at 55 sites, and to lateral stream erosion at 105 sites. Performance ratings are given for rigid and flexible revetment, for flow-control measures (spurs, dikes, spur dikes, check dams, jack fields), and for measures incorporated into the bridge. Streams are classified for engineering purposes into five major types, each having characteristics of lateral stability and behavior that need to be considered in the design of bridges and countermeasures. Hydraulic analysis was carried out for flood conditions at 60 bridges, for which values of flow, bridge, and geomorphic factors are tabulated. The report is in two volumes: Volume 1 - Analysis and Assessment; Volume 2 - Case Histories for Sites 1-283. (See also W79-10174) (Woodard-USGS)
W79-10175

STRUCTURE FOR AUTOMATIC OPENING OF SEDIMENT PLUGS,
Fukunaga and Associates, Honolulu, HI.
J. K. Nishimura, and L. S. Lau.
In Proceedings of the Specialty Conference on Coastal Structures 79/ASCE/Alexandria, Virginia/14-16 March 1979, p 921-940 (1979), 11 fig, 4 plates, 1 tab, 8 ref. Also Contrib. No. 107, Univ. of Hawaii, Water Resources Research Center, Honolulu. OWRT A-070-HI(1), 14-34-0001-7026, 8013.

Descriptors: *Hydraulic structure, Flood control, Froude number, *Channel improvements, Hawaii, Sand plugs, Stream mouths, Oahu.

Closure of stream mouths by littoral sediment is a natural condition of numerous small streams on islands like Oahu, Hawaii. Flood damages induced by floodwater flowing over banks before the blockage is either breached or over-topped can be substantial especially in urbanized areas. Solutions to the problem may be achieved by preventing the formation by using jetties or other similar structures or by removing or breaching the blockage in time before flooding. The first approach is often infeasible for small streams. Mechanical dredging is expensive and effective only if done in time and only for a limited period of time. There are in use hydraulic structures that utilize the hydraulic forces of the early arriving storm flow to breach the blockage. A new design of a hydraulic structure with non-moving parts for automatically opening coastal sediment plugs at small stream mouths has been developed. When positioned properly in the stream mouth, the structure will induce piping and erosion of the sediment plug progressing from the ocean-side toward the stream and resulting in prompt failure of the sediment plug and passage of the flood flow.
W79-10320

8G. Materials

BREAKWATER SYSTEM,
G. E. Hibarger, G. G. Hibarger, and D. W. Daniel.
U.S. Patent No. 4,150,909, 7 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 981, No. 4, p 1335, April 24, 1979.

Descriptors: *Patents, *Breakwaters, *Floating, Barriers Shore protection, Structures, Construction materials, Automobile tires.

A floating breakwater is provided consisting of a rectangular array of scrap tires interlocked together in a manner which entirely eliminates the use of tying cables to lash the tires together except for the use of cables in anchoring the floating array in position. A unique tire splice interlocks the tires together so that only tire material is used to construct the floating body, eliminating the need for lashing by cable, ropes which are subject to corrosion and deterioration. (Sinha-OEIS)
W79-10260

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HYDROLOGIC CHARACTERISTICS OF WALKER BRANCH WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2A.
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THE MAHANTANGO CREEK WATERSHED--GENERAL HYDROLOGY AND RESEARCH RESULTS,
Science and Education Administration, University Park, PA. Northeast Watershed Research Center.
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For primary bibliographic entry see Field 7C.
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Science and Education Administration, Orono, ME. North East Plant, Soil and Water Lab.
For primary bibliographic entry see Field 4A.
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WATERSHED RESEARCH IN EASTERN NORTH AMERICA, A WORKSHOP TO COMPARE RESULTS, VOLUME I, FEBRUARY 28-MARCH 3, 1977.
For primary bibliographic entry see Field 2A.
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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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